Chapter 3

Target Subsector Promotion Plan

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3.1 Automobile Assembly and Parts Industries

3.1.1 Automobile assembly industry

(1) Local automobile market

According to the Automotive Parts Industry Association (FAVENPA), approximately 3,940,000 motor vehicles of all types were sold in the country between 1965 and 1999, of which 2,280,000 units were still owned as of the end of 1999, accounting for 58%. Those used for less than 5 years account for 28.33%, 6-10 years 19.08%, 11-15 years 19.97%, and more than 15 years 32.63%. Thus, more than one half of automobiles used in the country are 11 years or older. Percentage compositions of automobiles by category and service life are shown below.

TABLE 3.1.1 AUTOMOBILES IN VENEZUELA, BREAKDOWN BY CATEGORY AND SERVICE LIFE

Category	0-5 years	6－10 years	11-15 years	Over 15 years
Buses/minibuses	21.62%	10.7%	8.06%	59.62%
Small trucks	34.72%	22.5%	14.72%	28.06%
Medium-sized trucks	27.55%	15.49%	19.09%	37.87%
Large trucks	20.53%	20.17%	16.82%	42.48%
Passenger cars	26.36%	18.07%	21.77%	33.79%
4x4 vehicles	31.82%	22.83%	20.58%	24.78%
Total	28.33%	19.08%	19.97%	32.63%

Source: FAVENPA

Notably, buses and mini-buses that form the core of public transport service, and medium-sized and large trucks responsible for inland transportation of goods are used for relatively long periods. As transportation service plays a vital role in ensuring smooth movement of goods and people, thereby to vitalize the entire economy, it is imperative to promote renewal of fleets of buses and trucks, while increasing the number of motor vehicles in service across the categories. Table 3.1.2 shows automobile ownership by category.

TABLE 3.1.2 AUTOMOBILE OWNERSHIP BY CATEGORY

Category	Number of units owned
Buses/minibuses	56740
Small trucks	323958
Medium-sized trucks	179074
Large trucks	22637
Passenger cars	1336614
4x4 vehicles	364418
Total	2283441

Source: FAVENPA

Based on the current ownership, annual automobile demand was estimated for the average service lives of 10 and 15 years, namely 228,000 and 152,000 units respectively. On the other hand, the present automobile population can be classified into local assembled vehicles and imported vehicles. As shown in Table 3.1.3, locally assembled vehicles account for approximately 88% of total. If assembled vehicles imported by local assembly manufacturers are added, approximately 94% of all automobiles owned in the country was supplied by local companies. (Note: The total ownership in Table 3.1.2 was different from that in Table 3.1.3 (difference of 52 units), but FAVENPA data were used without adjustment.)

TABLE 3.1.3 AUTOMOBILE OWNERSHIP BY SOURCE

Source	Number of units owned
Locally assembled vehicles	2003545
Vehicles imported by individuals	38779
Vehicles imported by local assemblers	137549
Vehicles imported by distributors	103516
Total	2283389

Source: FAVENPA

By country of origin, U.S. vehicles hold a dominant 58% share, followed by Japanese 20%, European 14%, Brazilian 5.4% and Korean 2.6% (on the rapid rise in recent years).

(2) Automobile assembly industry in Venezuela

At present, there are seven assembly companies operating in the country, which register with the Automobile Industry Association (CAVENEZ). The U.S. big threes are operating in Carabobo, two truck and bus assemblers in Aragua. Toyota and Mitsubishi have assembly plants in the east side of the capital, Sucre and Anzoategui. Other than the seven companies, two companies recently ceased their operations, Fiat in May 1999 and Honda in September 2000.

TABLE 3.1.4 AUTOMOBILE ASSEMBLERS OPERATING IN VENEZUELA

Assembler	Year started	Location (state)	Equity contribution by pared company
Daimler Chrysler de Venezuela L.L.C	1950	Carabobo	100%
Ford Motor de Venezuela S.A.	1962	Carabobo	100%
General Motors Venezolana C.A.	1948	Carabobo	100%
Iveco Venezuela, C.A.	1992	Aragua	-
Mack de Venezuela C.A.	1963	Aragua	-
MMC Automotriz S.A.	1990	Anzoátegui	Nissho Iwai 90%, JAIDO 10%
Toyota de Venezuela C. A.	1963	Sucre	90%

Source: JICA Study Team

The automobile assembly industry in the country grew rapidly after the Automobile Industry Act was enacted in 1962. As shown in the following table, the law was amended repeatedly and created the business environment that was highly unstable for both assembly and parts manufacturers.

TABLE 3.1.5 HISTORY OF THE AUTOMOBILE INDUSTRY ACT IN VENEZUELA

Year of amendment	Description
1975	To establish the final local content level at 90% under the initial Andean agreement.
1982	To lower the final local content level to 50% in consideration of the actual level of industrialization.
1985	To lower the mandatory export ratio to 50%.
1990	To abolish restrictions (permitting entry of new assemblers, allowing the change or addition of car types, and limited imports of assembled cars) and establish mandatory contribution to foreign currency reserve (PCD).
1991	Liberalization of imports of assembled vehicles (previously limited to models that are assembled in the country) and reduction of the rate of mandatory contribution to foreign currency reserves.
Reforma del 95	To amend the original law to ensure harmonization with the Andean agreement, then the Act was lapsed. (Major amendments) - To establish common tariffs for trade with non-CAN countries. - To allow imports of automobiles produced in the region at zero tariff. - To establish local content (33% for C1 category and 18% for C2 in 1999).
1999	The New Andes Automobile Law was enacted to lower local content significantly after 2000. (General outline of the new automobile law) Local content Category (1999) 2000 2001 ..... 2009 C1 (up to 16 passengers) (33%)) 24.75% 25.75% 4.75% Passenger cars/GVW (commercial vehicles up to 4.53 tons) C2 (Other vehicles) (18%) 13.5% 14.0% 18.0% Tariff rates CDK tariff …… 3% CAN common tariff Category C1 – 35%; C2 – 15% (Venezuela, Colombina) Category C2 – 10% (Ecuador)

Source: JICA Study Team

According to CAVENEZ's data, sales of locally assembled and imported vehicles changed significantly between 1990 and 2000 according to the change in the administration. Now, imported vehicles account for nearly 40% of the total. Note that the Figureures in the parenthesis denote the share of assembled cars imported by local assemblers. Annual variation of the Figureures is partially caused by withdrawal of Fiat and Honda, while it reflects the fact that assembly companies have been importing assembled cars to maintain their share.

TABLE 3.1.6 YEARLY CHANGES IN AUTOMOBILE SALES (1999 – 2000)

Year	Locally assembled	Imported (% by local assemblers)	Total	Administration
1990	41316	-	41316	Gobierno de Pérez (1989 – 94)
1991	70656	4267 (11%)	74923	
1992	87913	43676 (45%)	131589	
1993	81225	45086 (54%)	126311	
1994	56126	17948 (52%)	74074	Gobierno de Caldera (1994 – 99)
1995	77985	10997 (22%)	88982	
1996	55220	12635 (51%)	67855	
1997	35121	44736 (55%)	177857	
1998	21384	54366 (63%)	175750	
1999	71368	32971 (53%)	104339	Gobierno de Chávez (1999 -)
2000	88226	57080 (35%)	145306	

Source: CAVENEZ

On the other hand, locally assembled vehicles are exported mainly to Colombia and Ecuador, as shown in the table below. Exports fell sharply in 1999 partly due to deterioration of the neighboring markets and the decline in price competitiveness caused by the appreciation of the Bolivia.

TABLE 3.1.7 YEARLY CHANGES IN EXPORTS OF LOCALLY ASSEMBLED VEHICLES (1994 – 2000) AND IMPORTS OF VEHICLES ASSEMBLED IN THE CAN REGION

Year	Colombia	Ecuador	Others	Total (imports of CAN-assembled cars)
1994	15514	3698	91	19203
1995	15163	3754	222	19139
1996	12825	1876	22	14723
1997	16563	3236	2	19801
1998	11123	3510	34	14667
1999	1744	121	49	1914 (5572)
2000				3747 (15763)

Source: CAVENEZ

Among the local assemblers, GM, Ford, Daimler Chrysler and Toyota promote exports. Of 2,429 vehicles exported between January and May 2001 (according to CAVENEZ), GM accounted for 1,653, Ford 635, Daimler Chrysler 84, and Toyota 57. By vehicle type, passenger cars totaled 1,403 units (58% of total), 4x4 vehicles 748 (31%), small trucks 240 (10%), and medium-sized trucks 38 (2%), indicating high popularity of 4x4 vehicles in the CAN area.

(3) "Family car" project in Venezuela

The major change in the recent automobile market in Venezuela is the successful achievement of the "family car" project launched by the Chavez administration in August 1999. Under the five-year agreement signed with assembly companies, sales of locally assembled vehicles and small passenger cars made in Colombia have been growing rapidly. The outline of the project and models produced under the project are described below.

1) A general outline of the "family car" project

a. Technical specifications for "family cars": A two-door coupe or sedan accommodating a driver and four passengers, equipped with a 1,000-1,600cc, four-cylinder engine burning nonleaded gasoline, with an after-burner for pollution control; minimum fuel economy of 12km/liter; minimum guarantee for 30,000km or one year; spare pars for 10 years; service warranty; and sales price ranging between 4 million Bs and 5.5 million Bs, which may be varied according to the foreign exchange rate and inflation, subject to prior approval of the government.

b. Incentives: Assembled vehicles, imported parts, and locally produced parts are exempted from IVA. Assembly companies, parts suppliers and distributors are required to offer the designated discount prices, with the bank's financial service under favorable terms.

TABLE 3.1.8 (A) ASSEMBLY COMPANIES PARTICIPATING IN THE "FAMILY CAR" PROJECT AND MODELS OFFERED

Assembly company	Family car model	Sales price (July 2001)
Venezuela GM	Corsa 1400 manual	Bs. 6298000
Venezuela Ford	Festiva 1300 manual	Bs. 4380000
	Festiva 1300 automático	Bs. 4895000
	Fiesta 1600 manual	Bs. 665000
MMC	Accent 1300 manual	Bs. 6200000
Sofaven (Venezuela Renault)	R-19	Bs. 743900
	Twingo	Bs. 6250000
Venezuela Mazda	323	Bs. 6483000

Source: JICA Study Team

Note that the price of Ford Vestiva was as of August 2000 and the project model was switched to Fiesta this year. Vehicles assembled in Colombia and sold by importers of Renault and Matzda are considered as family cars.

TABLE 3.1.8 (B) SALES OF FAMILY CARS

Year	Locally assembled family cars	Assembled in the CAN area	Total	Total market
1999	3231	104339		
2000	28895	4977	33872	145306
2001 Jan-May	20971	3135	24106	79179

Source: CAVENEZ

TABLE 3.1.8 (C) SALES COMPOSITION BY MAKE AND MODEL

		2000	2001 Jan.-May
GM	Corsa	14538	13053
Ford	Fiesta	1609	4711
	Festiva	7743	51
MMC	Accent	5005	3156
Sofaven	Twingo	2112	1155
	R-19	2426	1347
Mazda	323	439	633

Source: CAVENEZ

The family car market has been growing steadily. If it expands at the pace recorded in the January-July 2001 period, the market will reach an annual size of nearly 60,000 vehicles, accounting for 30% of the overall market. Now, Toyota has obtained the government license for 1300cc Terios and plans to start sales at 7 million Bs in December this year. Daimler Chrysler has obtained the license for a family car made by Hyndai, called “Brisa.” As family-size cars have gained a more than 40% share in Brazil where an official support program to promote people’s car has been embarked earlier, the Venezuelan government expects the “family car” project to contribute greatly to growth of local automobile demand. Another factor for increase in local automobile production is the result of the negotiation between the Venezuelan and Colombian governments on tariff treatment of family cars; at present, family cars made in Colombia are exempted from IVA as they are imported to Venezuela, while those made in Venezuela do not receive the same treatment in Colombia.

(4) Automobile industry and free trade agreements

As mentioned earlier, Venezuela has signed and will sign a free trade agreement with neighboring countries, including the Andean agreement with Colombia and Ecuador, G3 with Mexico and Colombia, and MERCOSUR including Brazil and Argentina. The automobile industry must compete with counterparts in these countries, which are compared in the table below. For the immediate target, the Venezuelan industry should aim to become the leader in the CAN area.

TABLE 3.1.9 COMPARISON OF AUTOMOBILE INDUSTRIES IN VENEZUELA AND NEIGHBORING COUNTRIES

Country	Production (vehicles)	Exports	Ownership	Sales of automotive parts (US$)
Argentina	350000	13000	7000000	4000 millions
Brasil	1660000	360000	18000000	16000 millions
Mexico	1880000	1433000	12000000	13000 millions
Venezuela	94000	3747	2000000	800 millions
Colombia	51011	16777	2000000	500 millions
Ecuador	10989	2476	1000000	170 millions

Source: FAVENPA, JICA Study Team

As for local content, Argentina, Brazil and other MERCOSUR countries require 60% or higher, Mexico (NAFTA) specifies 62.5% for C1 category after 2002 and 60% for C2 category, which are much higher than 26.75% for C1 in 2002 and 34.75% in 2009, as required under the New Andean Automobile Law. Thus, Venezuela and other CAN countries are lagged behind in the localization process. In consideration of the size and potential of the domestic and export markets, the automotive parts industry in Venezuela aims to localize relatively simple parts and components, not including engines, transmissions and other power train components, which is very realistic and reasonable

As for free trade agreements on a regional basis, Venezuela has agreed on mutual exports of assembled vehicles with Colombia and Ecuador. As for the G-3 agreement involving Mexico, the automobile sector is negotiated separately from other sectors because of the significant difference in competitiveness between the two countries. While the G-3 agreement, which was agreed in June 1994 and became effective in

January 1995, is scheduled to reduce tariff rates to zero by January 1, 2995, governments and industries of the G-3 countries will establish the automobile committee to discuss and agree on a framework to reduce tariff rates on automobiles and parts to zero in around 2007. However, little progress has been made so far because Mexico intends to give priority to NAFTA (with the U.S. and Canada) whereas Venezuela and Colombia intend to provide favorable treatment for the CAN countries in order to reflect the competitiveness gap. At present, three automakers in Mexico export assembled vehicles to Venezuela, namely Nissan, Chrysler and VW, according to the Automobile Industry Association of Mexico (AMIA). It should be noted that import tariffs in Venezuela are equivalent to common non-community tariff rates under the New Andes Automobile Law. Mexico's auto exports to Venezuela are summarized as follows.

TABLE 3.1.10 AUTOMOBILE EXPORTS FROM MEXICO TO VENEZUELA BY COMPANY (1999 – January – April 2001)

Year	Nissan (passenger cars/commercial vehicles)	Chrysler (commercial vehicles)	VW (passenger cars)	Total
1999	1500 / 48	1,025	-	2573
2000	1331 / 54	610	-	1995
Jan.-Apr. 2001	634 / 14	79	85	812

Source: AMIA

(5) Current state of selected automobile assemblers and recommendations for revitalization of the parts industry

In June 2000, the study team visited three assembly companies, GMV, Ford and Toyota, to hear about production, localization policy and major business plans. The study team conducted a simple questionnaire survey, which results are summarized in Appendix Table 3.1.17 "Summary of Responses by Three Automobile Assemblers to the Questionnaire Survey."

All the three companies have more than three decades of experience in assembly operation. As the world leading auto manufacturers, they have subsidiaries in other CAN countries, MERCOSUR, NAFTA and other areas in the Americas and are carrying out a number of projects to align their business with various free trade agreements that are progressed in these areas. Thus, their plans and outlooks for future automobile business in the region are highly useful when we discuss the future of the Venezuelan automobile industry.

Notably, the three companies are equally enthusiastic about new capital investment and introduction of new models for the purpose of maintaining their position in the Venezuelan market. GMV invests $100 million to build a coating shop and aims to gain a 30% share in the domestic market, as encouraged by good sales of its family car "Corsa." Ford, which has switched its family car model from Festiva to Fiesta, plans to assemble its high grade model "Focus" that is currently imported as finished cars. Toyota has finally applied for participation in the "family car" project. Overall, these positive attitudes of the leading assembly companies constitute favorable factors for the future of the Venezuelan automobile industry.

Also, the three companies export assembled vehicles to the neighboring CAN countries. This is an important factor for Venezuela to establish its leadership position under the CAN agreement. Given the geographic advantages, the Venezuelan industry should target export markets in Andean countries, Central America and the Caribbean. Meanwhile, popular models in the Venezuelan market will shift from family-size cars, as currently promoted by the government, to compact cars with good fuel economy, which are widely accepted in Europe and Japan. Together with the anticipated popularity of 4x4 vehicles, therefore, the market will become similar to Brazil and Argentina, rather than Mexico. In fact, GMV and Ford appear to show enthusiasm in introducing compact cars that are well sold in Brazil and Europe.

As for local content, all of them make intensive efforts to improve quality of their own suppliers. They require suppliers to obtain certification under international or internal standards (GMV – QS9000, ISO9000 and ISO14000; Ford – Q1 and QOS; Toyota – Circulos Kaizen) and warn that suppliers failing to obtain it may be dropped from the supplier list. These moves are consistent with the world trend where automakers attempt to foster suppliers while selecting them severely in response to the intensified and globalized competition that requires them to procure best-of-breed parts and components form world sources. This will be discussed again in the section on the parts industry.

Finally, recommendations for government policy and strategy for the future development of the Venezuelan automobile industry are summarized as follows.

a The New Andes Automobile Law, which is effective until 2009, is based on the international agreement with Colombia and Ecuador and cannot be revised unilaterally,

as in the case of the previous automobile industry law. As a result, it is trusted by the automobile industry and allows assemblers and suppliers to establish their business plans according to longer visions. The law has been adopted on the basis of experience and lessons learned from the government policy on the automobile industry over three decades. It is therefore important to maintain the law as the basis of the industrial policy and implement the future policy in consistent therewith, thereby to allow assemblers and suppliers to pursue long-term strategies.

b. It is desirable to promote the family car policy that will contribute to the further growth of local automobile production. In this connection, the government should negotiate with neighboring countries to obtain preferential treatment (exemption of IVA) for family cars made in Venezuela, which is granted to family cars imported from these countries. At the same time, it is recommended to maintain the incentive program on family cars as they are effective in providing an impetus for the automobile industry and establishing the industry's foundation.

c. Similarly, it is urgent to eliminate the unfair treatment on automobiles used as tax cabs. At present, taxi cars imported from third countries are exempted from IVA under the Decree No.126 dated May 5, 1999, while those assembled in the country are subject to IVA. Fair treatment will contribute to further growth of local automobile assembly.

(Note: Unfortunately, collection of data on taxi cars by the trade association, CAVENEZ, this year, was started only this year and no historical data is available. Also, some importers of assembled cars do not report their production data to CAVENEZ. CAVENEZ's data in January through July 2001 are therefore considered to be incomplete and are presented for reference only, as follows. An importer put an advertisement on taxi cars, entitled "for 16,000 tax drivers," which suggests that local domestic is larger than the figures.)

TABLE 3.1.11 DOMESTIC SALES OF TAXI CARS (JANUARY – JULY 2001)

Locally assembled	Accent	849 units	Imported	Siena	1521 units
				Sephia	156
				Sentra	431
				R—19	530
				Symbol	485
Total		849			3123

Source: CAVENEZ

d. Majority of tax cars in the country are used for 11 years or longer. It is important to encourage replacement of the old fleet not only from the viewpoint of traffic safety, but economic stimulus as well. The government is expected to provide tax and other incentives for purchase of commercial vehicles, including preferential treatment on locally made vehicles in government procurement.

e. As the economy has still to recover from recession, measures should be taken to ensure balanced growth of locally made cars and imported ones by controlling the latter from third countries within a specific percentage of the former. At the same time, the government should make efforts to create level playing fields for the automobile industry under the regional free trade agreements.

f. Foreign exchange and financial policies should be directed to the development of international competitiveness in the long run, in the context of pursuing industry policy focusing on promotion of non-oil industries including automobiles.

3.1.2 Parts industry

(1) General background

The Venezuelan automobile industry dates back to the late-1940s when General Motors de Venezuela and Ensamblaje Venezolano C.A. were established. The latter assembled Chrysler's cars and later became Chrysler de Venezuela S.A. Emergence of the two assembly companies gave birth to the automotive parts industry. Initially, the industry was limited in scope to production of standard parts, such as tires, tire tubes and batteries and primarily met demand for replacement parts. In the late 1950s, the government moved to foster the automobile and automotive parts industries and steered its policy to protectionism by banning imports of assembled cars and enacting other laws and regulations to promote the industries. In 1962, the government introduced the "local content" policy to require the use of local parts and components for local assembly by enacting the Automobile Industry Law. The assemblers were required to incorporate local parts and components to a minimum percentage by selecting them from a list of available parts. This marked the formal start of the automotive parts industry in the country.

Today, there are well over a hundred automotive parts suppliers of varying size, of which 80 companies are relatively large and members of FAVENPA. Therefore, data on the automotive parts industry shown in this report are based on those published by FAVENPA

As discussed earlier, majority of automobile assembly manufacturers are located in industrial estates in Carabobo and Aragua, which are in the central area surrounding the capital city of Caracas, whereas two Japanese companies (Toyota and MMC (Mitsubishi/Hyundai)) are operating in eastern states of Sucre and Anzoategui. Geographic distribution of the 80 suppliers reflects that of assemblers. 67 companies are concentrated in the central area, including the Caracas metropolitan area (10 companies), Miranda (15), Carabobo (29), and Aragua (13). On the other hand, only 13 companies are located in the west and east areas, namely Tachira (3), Lala (2), Torjiro (1), Cojedes (1), Sucre (4), and Anzoategui (2). Furthermore, auto sales in 2000 and January-May 2001 show that unit sales of vehicles suppliers by assemblers in the western area (GMV, Ford, Daimler Chrysler, Iveco and Mack) are around three times those by assemblers in the east (Toyota and MMC). This indicates that the assemblers in the east area compete fairly with those in the central area despite

geographical concentration in the latter. At the same time, Toyota and MMC enjoy benefits from proximity of their plants to two ports of Cumana and Barcelona, compared to the assemblers in the central area, which can use only the Cabello port.

(2) Automotive parts market

Sales of automotive parts, as measured by FAVENPA data, remained more or less unchanged during the past four years after a major decline in 1998 due to the decrease in local assembly production (Table below). Furthermore, the market was almost equally divided among original equipment manufacturer (OEM) parts, replacement parts (REP), and exports (EXP), although no data on individual suppliers are available from FAVENPA. These sales data are compared with Mexico, Brazil, Argentina and other CAN countries to show production capabilities of automotive parts industries in Venezuela and the Andes countries (CAN, Comunidad Andina de Naciones).

TABLE 3.1.12 AUTOMOTIVE PARTS SALES TREND IN VENEZUELA

(US$ Million)

Category	1977	1998	1999	2000	2001
OEM	480	390	260	280	350
REP	310	240	240	260	250
EXP	215	250	240	240	260
TOTAL	1,005	880	740	800	810

Source: FAVENPA

TABLE 3.1.13 COMPARISON OF AUTOMOTIVE PARTS SALES IN CAN COUNTRIES AND MAJOR AUTOMOBILE PRODUCING COUNTRIES IN LATIN AMERICA

(US$ Million)

Country	1999	2000
Brazil	14,500	16,000
Mexico	12,000	13,000
Argentina	3,000	4,000
CAN countries in total	1,500	1,470
Venezuela	740	800

Source: FAVENPA

In Venezuela, automotive parts suppliers are required to submit to the government the list of OEM parts they have supplied to assembly companies for the purpose of monitoring compliance with the local content policy. FAVENPA receives data from the government and updates its localization database (Matriz de Incorporacion Nacional) annually. The study team compiled its own list of localized parts and their suppliers (Table 3.1.19) from the database to show how far automotive parts are localized at present. Note that suppliers included in the list were identified on the basis of their self-claimed product lists and items listed in FAVENPA's list, and they may need some correction to reflect the actual situation.

(3) Major issues facing the automotive parts industry

Major issues identified from discussion among FAVENPA member companies, both general and specific to each product category, were identified as follows.

1) General issues

- Small production volume to create heavy financial burdens related to amortization of tooling costs
- High costs due to high tariff on imported raw materials, and high prices for domestic raw materials that exceed international prices
- The so-called "cost-penalty-zero" request by assemblers discourages localization or makes product development difficult (many complaint about credibility of target prices specified by assemblers and confidential requirements for CKD vehicle prices)
- Limited access to technology, and the lack of enthusiasm among R&D departments of assemblers, which give priority to cost cutting over technical assistance
- Assemblers do not have interest in localization of low-cost, small parts.
- Assemblers do not provide support for exports that would contribute to production increase.
- High idling rate (below 60%)
- Parts and components made in Venezuela are less used in the manufacture of automobiles in Colombia, compared to the use of parts made in Colombia for assembly in Venezuela.

2) Product category

- Exhaust system: Assemblers use imported catalytic converters and do not provide support for localization. Assemblers use imported catalytic converters. Local

suppliers are capable of manufacturing other parts in terms of technology and capacity, but their operating rate is very low, 30% on average. They use both imported materials (stainless steel, aluminum and steel) and local materials (galvanized plates), and the latter is expensive and contributes to high costs. Sidor is expected to supply them at international prices. There is a significant difference from target prices indicated by assemblers. As locally made parts and components account for more than 90% of the repair parts market, they can be competitive in the Andes market.

- Metal press parts: As there is no demand for repair parts, the decrease in assembly units causes the increase in tooling cost. If Sidor supplies raw materials (steel materials) that account for 30% - 60% of the total at international prices, metal press parts will gain competitiveness. Local suppliers are technically capable of making metal press parts required by assemblers, excepting bodies. As the tooling cost is proportional to the size and complexity of a component, the tooling cost for small parts can be borne by suppliers and that for large parts should be paid by assemblers. To facilitate amortization of the tooling cost, efforts should be made to secure a sufficient amount of production by promoting exports. At present, however, suppliers suffer from production decrease as assemblers terminate localization of small, metal stamping parts or do not show interest in product development.
- Air-conditioners and cooling systems: The capacity utilization rate is 25% for air-conditioners and 50% for radiators. As for air-conditioners, reputation for local products varies with assemblers. Also, the licensing fee is very high (around $300,000) and increases the initial cost, while royalty, market restriction, and purchase obligation on specific components present problems. Besides, raw materials imported for production of air-conditioners and radiators (aluminum pipes and fins) and related parts are subject to 10% - 20% tariffs, which affect competitiveness of final products. In the domestic repair parts market for air-conditioners and radiators, local products represent 60% and imports 40%. However, intensifying competition due to under-invoice of imports and smuggling is being concerned.
- Plastic parts/interior parts: Plastic parts, other than extrusion molded parts that require the high tooling cost, can be locally made, but production costs are high due to the high die cost caused by small production volume and high tariffs (10% - 20%) on imported raw materials and parts. The capacity utilization rate is 35% for floor mats, 50% - 70% for interior parts, 25% for plastics parts, and 70% for

lamps. Suppliers expect effective measures to be taken to lower material costs and improve product competitiveness, such as the implementation of the special tariff system (ATPA).

- Audio and electrical systems: Suppliers have experience in exports of batteries, antennas, speakers and radios, but they are concerned about the pace of technological innovation. As local production of advanced parts requires sufficient production volume and technology, more and more assemblers have switched to imports. The capacity utilization rate is 35% for batteries and antennas, and more or less the same for radios and speakers. As seen in interior parts, modular production of parts will progress in this market segment (assemblers outsource to suppliers the development and assembly of parts in larger units).
- Insulators, tubes, hoses, and filters: Basically, these items can be produced on an OEM basis. Filters are mostly incorporated into engines as part of CKD imports. The capacity utilization rate is low at 25% - 40%. Suppliers are concerned about the sluggish market, the overvaluation of the currency, high prices for local materials, and unfavorable payment conditions by local manufacturers (advance payment and payment in the U.S. dollars), such as PDVSA, NEGROVEN, SIDOR, PETROPLAS, and SIMAQUIMICA). Filters may lose share to imports of copy products.
- Safety glass: Except for capsule glass that requires expensive capital investment, safety glass can be produced locally on an OEM basis. At present, an increasing number of assemblers use glass made in the Andes countries, which quality is lower than those made in Venezuela. It is recommended to require assemblers to comply with the national standard for safety glass, COVENIN. The capacity utilization rate is around 45% for local suppliers.
- Brake systems, suspensions, and power trains: Production of parts and components related to suspensions and power trains, except for engines and transmissions, is mainly made by DANAVEN Group. Manufacturers of these products have the highest level of production technology in the country. They export frames for large trucks and buses to North America.

Finally, competitiveness of selected parts by category, in terms of potential demand in various markets, is evaluated and summarized as follows.

TABLE 3.1.14 COMPETITIVENESS ASSESSMENT OF AUTOMOTIVE PARTS IN VENEZUELA

Parts category	Domestic market	CAN	World	OEM/ replacement	OEM/ replacement	OEM/ replacement
Press parts	Some	No demand	None	No demand	None	No demand
Chassis	Yes	Yes	Yes	Yes	Yes	Yes
Battery	Yes	Yes	Yes	Yes	No	Some
Suspension	Yes	Yes	Yes	Yes	Some	Some
Propeller shaft	Yes	Sí	Yes	Yes	Some	Some
Upholstery	Yes	Yes	Some	Some	None	None
Engine components	None	Yes	None	Some	None	Some
Air-conditioning/ cooling systems	Yes	Yes	Yes	Yes	None	Some
Wheels	Yes	Yes	Yes	Yes	Yes	Yes
Tires	Yes	Yes	Yes	Yes	Some	Some
Glass	Yes	Yes	Some	Some	None	Some

Fuente : FAVENPA

Overall evaluation of competitiveness among FAVENPA members indicates that most parts are considered to be competitive in domestic and CAN markets for repair parts, while opinion is divided for OEM, i.e., some parts are considered to be fairly competitive and others somewhat competitive. In the world market, most parts are not competitive enough, except for some categories that have some competitiveness as OEM or replacement parts. Thus, most parts are suitable for domestic and CAN markets, but not competitive in the world market with a few exceptions (DANAVEN's chassis frame and Rualca's aluminum wheels).

3.1.3 Implementation plan for promotion of the target subsectors

Except for DANAVEN that makes international class products, responses obtained from the sixteen suppliers during the interview survey are summarized in Table B "Summary of Responses from the Interview Survey of Automotive Parts Manufacturers in Venezuela." They are divided into OEM suppliers (11) and replacement parts manufacturers (5). All of them are classified as SMEs and their product qualities vary greatly, from excellent to poor. Comments on individual firms are given in the "Areas to be improved" column. General recommendations are made in the following section.

(1) Localization of automotive parts

It is recommended that assemblers and suppliers start general discussion on the future localization plan in the context of a long vision through 2009 and on the basis of the New Andes Automobile Law, which constitutes an international agreement. And based on the long vision, they have to make efforts to reinforce competitiveness of automobiles and parts made in Venezuela. As for Category C1, they should achieve localization at an incremental rate of 1% per year (0.5% for Category C2). Assemblers and suppliers need to initiate joint R&D efforts by considering the sluggish market as an opportunity for change. Each assembler is engaged in intensifying competition all over the world, which accelerates the pace of technology development and standardization of engineering technologies for automotive parts. The situation calls for closer collaboration between assemblers and suppliers that make OEM parts. The government is therefore expected to urge CAVENEZ and FAVENPA to take necessary actions to further these objectives and ensure compliance with the New Andes Automobile Law. At the same time, in light of the fact that latest automotive technology is directed toward commercialization of light weight cars and use of diverse materials, the government mobilizes industries and other related parties to study feasibility of development of automotive parts using aluminum and plastics – in which the country has comparative advantage – and local production of automotive parts with international competitiveness. In the connection, Table 3.1.16 shows the changes in composition of raw materials for standard-sized and compact cars in Japan, and Table 3.1.17 summarizes the current state of development of aluminum and plastics parts made by Japanese automakers and suppliers.

(2) Introduction of uniform tariff rates and reduction

It is recommended to reduce import tariffs on raw materials and part used for production of automotive parts to a uniform 5% or 3% (applied to CKD parts). Current tariff rates range between 5% and 20%, which leads to high production costs and the illegal practice in customs clearance. In the world automobile industry that is in the process of globalization, automotive parts are increasingly modularized by incorporating multiple parts into a larger component. Tariff reduction on raw materials and parts to be incorporated into modules is therefore effective and essential in meeting the needs for sophisticated and modularized parts that are realized by development of automobile technology, while reinforcing international competitiveness of parts made in the country.

(3) Adaptation to increased production of modular parts

Production of modular automotive parts can lead to the clustering of the parts industry in an open competition environment (not captive relations). Assemblers and suppliers have to discuss, together with the long-term nationalization plan, the system to allow the effective use of technology, machinery, equipment and labor force for the purpose of supporting joint efforts of suppliers to develop and manufacture higher value added parts Joint development and production can lead to localization of parts that were previously considered as unsuitable for local production, and improvement of competitiveness of locally made parts in terms of delivery schedule, quality and price.

(4) Enhancement of the skill training system

It is recommended to establish a training system to teach basic skills to field workers of small suppliers. Automotive parts suppliers can be classified into OEM suppliers that can improve competitiveness through various promotional initiatives proposed above, and other suppliers that cannot benefit from promotional efforts and continue to serve the repair parts market. The former can improve production techniques through the guidance of assemblers and can win jobs therefrom, while the latter does not have opportunity to receive assistance from assemblers. Also, suppliers other than OEM, which are mostly SMEs, cannot expect to improve production techniques because they cannot afford to send workers to training programs offered by INCE, CEMA, CEDEA or other organizations, or their workers need to learn basic skills that are not taught by the above organizations. Small suppliers do not require advanced skills, but basic skills to shape metal, plastics and aluminum parts through machining or molding operations, followed by finishing and surface treatment. It is therefore recommended that basic

production skills and production management techniques, which allow SME workers to improve quality and productivity by making best use of existing equipment, should be taught at public training institutes and at affordable costs. And instructors should be recruited from retired workers of assemblers and large suppliers. In the future, the training program should be expanded to instructors' training to allow field guidance for SMEs.

(5) Recommendations for small- and medium-sized automotive parts manufacturers in Venezuela

1) OEM suppliers

- They are entering the age of free competition. To win customers, priority should be given to quality improvement (they have to make marketable products, not commodity parts) and cost reduction. These goals can only be achieved by redesigning their operations in ways to maximize work quality and efficiency, under the leadership of the management. Efforts should start from promotion of 5M (Mono de obras, Materiales, Maquinas, Medidas, Medio Ambiente) activities in order to eliminate or minimize in-process defects.
- Efforts should be made to develop good relations with assembly companies, including close communication and interdependence. In particular, suppliers should be ready and willing to meet customer demand for quality control and its improvement, which enable them to keep abreast of the technology trend in the automobile industry.
- Free competition means a wider opportunity. Suppliers are free to approach different assembly companies and develop new marketing channels. However, they should not be overzealous about new business opportunity. They should avoid entering a market or a field in which they do not have competitive strength and which is expected to incur loss.
- Factories should be run by the optimum number of workers. They cannot afford to accommodate surplus labor, which should be assigned to sales and product development activities. While factory workers make products and profits, others have to work hard to develop new products and technologies.
- Collaborative relations with other suppliers, including competitors, should be pursued in an attempt to start a new business by combining resources in a synergetic way, including joint development and production by sharing production equipment, techniques and labor force..

- IT should be fully utilized to improve productivity in the entire business process and marketing activity based on the Internet should be vigorously pursued..

2) Replacement parts manufacturers
   - Managers should trace their products through distribution channels to check customer satisfaction and the changing market needs. They should realize that they make marketable products, not commodity parts, and they should be proud of supply such products.
   - For the same reason, they should pursue the best workmanship and product packaging, which make products look more attractive.
   - Efforts should be made to develop niche products, which holds the key to continuous business expansion.
   - IT should be fully utilized and collaborative relations with other suppliers should be established and maintained to collect market and other information and advertise the company and its products.
   - The OEM contract should not always be a final goal for suppliers. Niche markets provide opportunity for business expansion It is important to make a right decision on the basis of the real ability and strength.

3) Support for SME managers
   - One stop service via the Internet should be introduced to provide assistance and advice for SME managers who cannot often find or afford to outside advisors. Also, it is recommended to establish an Internet-based self-evaluation system (Sistema de Autodianostico) and an official program to train SME consultants.
   - The low interest rate, long-term loan program for SMEs should be expanded.
   - Efforts should be made to promote broad-based human resource development by establishing education and training courses on radio, TV or Internet (Many SMEs workers have not finished secondary education.) and the certification system.

TABLE 3.1.15 YEARLY CHANGES IN COMPOSITION OF RAW MATERIALS USED FOR STANDARD-SIZED AND COMPACT CARS IN JAPAN

(Unit: %)

	1973	1977	1980	1983	1986	1989	1992	1997	2001
Pig iron	3.2	3.2	2.8	2.2	1.7	1.7	2.1	1.8	1.5
Steel	60.4	61.6	60.5	59.5	57.7	56.9	54.9	52.1	54.8
Special steel	17.5	16.1	14.7	14.3	15.0	15.1	15.3	16.9	16.7
Non-ferrous metal	5.0	4.7	5.6	5.6	6.1	7.4	8.0	9.6	7.8
Aluminum	2.8	2.6	3.3	3.5	3.9	4.9	6.0	7.5	6.2)
Non-metal	13.9	14.4	16.4	18.4	19.5	18.9	19.7	19.6	19.2
Plastics	2.9	3.5	4.7	5.7	7.3	7.5	7.3	7.5	8.2)
Total	100	100	100	100	100	100	100	100	100
Changes in per unit weight	100.0	106.5	105.9	102.7	106.8	115.1	136.8	141.3	162.6

Source: Japan Automobile Manufactures Association (JAMA)

Note: This table composition of raw materials used for production of standard-sized and compact cars as input per vehicle. The data do not trace the same models, and car models, survey coverage, and product mix vary with years.

TABLE 3.1.16 CURRENT STATE OF COMMERCIALIZATION OF ALUMINUM AND PLASTICS AUTOMOTIVE PARTS IN JAPAN

Aluminum parts				
	Castings	Forgings	Sheets	Extruded
Engine components	Engine blocks Cyclinder heads Cyclinder head covers Pistons/calibrators Fuel pumps Intake manifolds Oil pans/pumps Water pumps	Pistons Valve lifters	Engine hoods	
Chassis parts	Transmission cases	Suspension arms		Frames
Exterior and interior parts	Clutch masters Shift folks Power steering pumps Brake disk calipers Brake drums Brake masters Proportioning valves Wheels	Compressors for air-conditioners Wheels		

Plastics				
	Injection molding	Extrusion molding	Blow molding	Other molding methods
Engine parts	Timing belt covers /radiator tanks, radiator fans distributor caps intake manifolds cylinder head covers		Radiators/tank duct Fuel tank duct	Battery trays Cylinder heads Covers
Steering	Steeing wheels Steering column covers Wheel cover caps Oil seals, accelerator pedals Shift lever knobs	Uniform joint boots		
Chassis parts Exterior and interior parts	Bumpers, fenders Mud guards, instrument panels Grove boxes Door pockets Ducts, ashtrays, lamp housing	Mud guards Trims	Washer tanks, trims sheet frames air spoilers	Molded crown sheet Frame Sunroof housing Inner panel pads Steering wheel Headrest

Source: Japan Automobile Manufactures Association (JAMA)

TABLE 3.1.17 SUMMARY OF RESPONSES TO THE QUESTIONNAIRE SURVEY OF AUTOMOBILE ASSEMBLERS IN VENEZUELA (1/2)

Question	Venezuela GM	Venezuela FORD	Venezuela TOYOTA
Domestic sales in 2001 (vehicles	200,000	200,000	165,000
Target share	30%	FORD Share 16%	(120,000 vehciles locally)
Capacity expansion plan	Yes	Yes	Yes
Location	Present site	Present site	Present site
Present site area	Same as FORD	420,000m2	260,000m2
Advantages of Venezuela	Competitiveness of labor force, geographical a	Geographical advantage	Domestic market
Imports of assembled cars	Exports to ANCOM	Exporting	Exporting
Localization	To boost local content	To boost local content	To boost local content
Local materials	Both	Local materials	Both
ANCOM-sourced materials			
Sectors requiring localization	Plastics, dies	Plastics	Casting, plastics
	Machining	Dies and molds	Rubber, electroplating, machining
	Raw materials (resin, steel plate)		Dies, forging, raw materials
			All required, especially quality and
			cost competitiveness
Problems related to localization	High price, technology	High price, poor qulaity	High price, poor qulaity
		Unreliable lead-time, insufficient production capacity	
		Technical limit	
Experience in attracting foreign suppliers	Yes	Yes	Yes (Yazaki, Sango, Kayaba)
Long-term, exclusive contract with suppliers	Interested	Interested	Interested but difficult in Venezuela
Presence of suppliers' club	None (Consejo de Proveedores)	None（Favenpa）	None
Support for suppliers	Technical assistance in Venezuela	Technical assistance in Venezuela	Technical assistance in Venezuela
Experience in joint efforts with other assemblers	Education and training, furnishing of dies	Education and training (including overseas)	Education and training, and furnishing of materials
	Equity participation（Rualca）	Furnishing of materials (consignment basis), and management suupport	
	None, but willing to do so	Yes	Yes
Standardization of parts and components	Not feasible	Standardization by suppliers	Not feasible
Experience in cooperation related to technology transfer to suppliers	Interested in technical assstance	Ready to provide technical assistance	If terms are agreeable,

TABLE 3.1.17 SUMMARY OF RESPONSES TO THE QUESTIONNAIRE SURVEY OF AUTOMOBILE ASSEMBLERS IN VENEZUELA (2/2)

Question	Venezuela GM	Venezuela FORD	Venezuela TOYOTA
	Difficult to cooperate with competitors		technology transfer will be considered
Globalization			
Reaction to free trade agreements	Under consideration (CAN)	Not considered	Under consideration
Advantages for Venezuela	Geographical location	Diversity	Geographical location
Disdvantages for Venezuela	Market size, economy (foreign exhchange rate)	Lack of competitveness	Market size, quality/cost competitiveness
Number of suppliers used	100 (70 Venezuelan, 30 ANCOM)	55	45 (42 Venezuela, 3 Colombia)
Request to government	Insufficient infrastructure	Insufficient infrastructure	Insufficient infrastructure
	Government policy	Low levels of technical education	Low levels of technical education
	Exemption of IVA for imported vehicles for public transportaiton		
	Unfair treatment o IVA		
	between imported family cars and		
	Venezulean family cars in imported countries		
	Government procurement		
	Lack of special import program		
	CKD parts for assemblers		
	CKD parts for suppliers		
Other data			
Number of employees	2000	1500	757
Production capacity	250 vehicles/day	251 vehicles/day	105 vehicles/day
Production rate per date	200－210 vehicles	180	77－80
Year of establishment	1948	1962	1963
Location	Valencia, Carabobo	Valencia, Carabobo	Cumana, Sucre
Domestic sales			
2000	28,654	21,250	12,616
January - May 2001	19,861	9,630	6,196

Source: JICA Study Team

TABLE 3.1.18 SUMMARY OF AUTOMOTIVE PARTS MANUFACTURERS VISITED BY THE STUDY TEAM

Parts manufacturer	Location	Year of establish-ment	Employ-ment	Major products	Market	Production equipment	Technology	Operat-ing rate	Major problems	Area of improvement/evaluation
Derivados Electronicos, C.A.	Ciudad de Caracas	1962年	130	Radio, speakers	OEM/repair part market	Assembly-based production line	Unable to develop proprietary technology	30%	Need for production technology to make multifunctional radio	Should be specialized in simple assembly
Altensa Fabrica de Alfombras S.A.	Estado de Aragua Parque Industrial Caguae	1968年	58	Floor mat	OEM/repair part market	15-20 years in operation, no prospect for financing investment	Capable of meeting local requirements	30%	Need for strong sales force	Good relations with assemblers good effect is expected from guidance for inventory control and sales promotion
Goma,C.A.	Estado de Carabobo Pq.Ind. de Valencia	1980	15	E/G, T/M installation base	Repair part market	No prospect for financing the upgrading of aged equipment	Using conventional technology, doubtful about product development capabilities	30%	Deterioration of price and technology competitiveness	Second-generation manager, with willingness to expand business Market survey and product development hold the key to future growth
Epecuen de Venezuela, C.A.	Estado de Carabobo Parque Industrial de Valencia	1984	40	Brakes, cylinders	Repair part market	15 years in operation, expecting financial aid for investment from -	Switched to CKD due to high material costs, and reduction of defect is required	80%	High raw material prices, strong local currency, aging equipment	Switching to CKD production using ATPA, management
Industria Victoria, C.A.	Estado de Aragua Parque Industrial Caguae	1985	132	Lamps and lenses	Repair part market	14 plastic injection molders	Factory layout and product finishing process need to be improved	80%	Lack of dies, strong currency, certification by Colombia	Conscious export efforts, many improvements achieved in factory management
Venezolana de Filtros, C.A.	Estado de Miranda, Parque Industrial de Charallave	1960	70	Air/oil filters for replacement	Repair part market	Aging equipment and poor quality and process control	Factory layout and quality control system need to be improved	40%	Slow loan review of Foncrei	Need for fundamental improvement of production management
Mamidel,C.A.	Estado de Miranda, Carrizal, Estado de Sucre, Cumaná	1967	60	Press parts	OEM	Well maintained equipment and machinery	Awarded by Toyota for "kaizen" activities and results	40%	Decrease in order and looking for diversification	Need to find new customers
Venezolana de Faros, C.A.	Estado de Lara, Barquisimeto	1974	60	Lamps, lenses, safety triangular reflectors	OEM/repair part market	Equipped with plastics injection molding machine, Fotometria	Safety triangular reflectors obtained certification in the U.S. and Europe	70%	Succeeded in niche product development, active in R&D	Need for maintenance and upgrading of technology and quality levels
Fabrica de Silenciadores Fasil. C.A.	Estado de Lara, Quibor	1995	10	Mufflers	Repair part market	Aging equipment	Low technology levels	40%	Unskilled workers, absence of advisor to manager	Need for reinforcement of sales organization
Fabrica Nacional de Abrazaderas, C.A.	Estado de Lara, Barquisimeto	1971	17	U bolts and nuts	OEM/repair part market	Aging equipment	Unskilled workers, and technology stagnated	40%	All workers were dismissed due to the failure in year-end labor contract negotiation	Difficult to maintain previous technology levels, and need for reassessment of products and market survey for sales expansion
Jet－Filter C.A.	Estado de Cojedes, Tinaquillo	1965	80	Air/oil filters	OEM/repair part market	Upgrading of equipment is suspended due to high interest rate	Technology levels to meet local requirements, but not export markets	70%	In the process of obtaining ISO9000 certification, and use of foreign financial	Need for improvement of die and product management, hedging against overseas finance under currency devaluation
Fabrica de Radiadores Agnelli & Ponte, C.A.	Estado de Cojedes, Tinaquillo	1951	75	Radiators	OEM/repair part market	Excess capital spending, limitation of copper radiators	Failure in conversion to aluminum radiators	20%	Lack of working capital, excess capacity and financial burden	Need for disposition of some facilities and equipment, and fundamental restructuring of core business
Metaltronic, C.A.	Ciudad de Caracas	1967	50	Radio and antenna	OEM/repair part market	Considering equipment upgrading, slow review of Foncrei	Receiving technical and financial assistance from Harada (Japanese company)	40%	Good process and quality control under Harada's guidance	Successful specialization in niche products, need for improvement of scrap control
Metalmecanica Patrissi, C.A.	Estado de Aragua, Turmero	1974	24	Press parts	OEM	Good equipment maintenance, and dies are purchased	Required to obtain contracts from other companies	30%	ISO9000 certification was obtained in Q1	Need for stepping up effort to increase orders for press parts, and additional business that does not require capital spending
Ploeca	Estado de Carabobo, Parque Industrial Valencia	1987	10	Tires, balancers	OEM/repair part market	Aging equipment, but sufficient to meet domestic demand	In the process of obtaining ISO9000 certification, Q1	50%	Dominating niche markets	Need for improvement of working environment, and management of raw materials and products
Light Alloy Products, C.A.	Estado de Carabobo, Mariara	1985	115	Aluminum wheels	OEM/repair part market	6 die casting machines, many aging machines	Graving casting techniques, poor quality	50%	Local material prices soar, and 100% advance payment at international prices	Maintaining competitiveness by good production and inventory management, and cost reduction efforts

Source: JICA Study Team

TABLE 3.1.19 LIST OF LOCALIZED PARTS AD COMPONENTS, AND SUPPLIERS (1/3)

Automotive parts		Part makers
Air-conditioners, cooling systems	6 companies	Aire Acondiconado Integral, S.A. AAISA
・Air-conditioning compressors		Componentes Delfa, C.A.
・Air-conditioning condensers		Compresores Rotativos Venezolanos, S.A. "Coroven"
・Air-conditioning ducts		FAACA Division Termica
・Air-conditioners assay		FAACA Division Plasticos
・Evaporator modules		Venezolana de Radiadores, S.A. "Versa"
・Radiators		
Insulation/Soundproofing	4 companies	Favengo, C.A.
・Soundproofing materials and heat insulators, etc.		Industrrias Incapeca Goma, C.A.
・Rubber weather strips, etc.		Loctite Venezuela,C.A.
・Rubber for pedals		Plastidrica, C.A.
・Heat-insulating panels		
・Sealants/sealers		
Audio/electric systems (harnesses)	6 companies	Acumuladores Duncan, C.A.
・Batteries		Acumuladores Titan, C.A.
・Alarms		Alcoa Fujukura Ltd. De de Venezuela, C.A.
・Radio antennas		A.V.F.A.
・Wire harnesses		Derivados Electronicos, C.A. "Dervelca"
・Speakers for automobiles		Metaltronic,C.A.
・Radio-cassette players		
Body chassis and accessories	10 companies	C.A. Danaven Division Parish
・Battery carriers		Comebu, C.A.
・Hinges and bars for hoods, trunk lids		FAACA Diviison Metalmecanica
		Goma, C.A. "Gomaca"
・Beds of small pick-up trucks		Industrias Metalmecanicas Forums, S.A.
・Chassis (4x4, commercial vehicles)		Mamidel,C.A.
・Trailer hooks		Metalmecanica Patrissi,C.A.
・Fire panels (for Toyota FJ)		Metalpartes Esposito,C.A.
・Metal bumpers		Multiprens,C.A.
・Plastic bumbers		OCI Metalmecanica,C.A.
・Pedals		
・Metal parts for bodies		
・Floors and accessories		
・Bumbers, chassis, supports		
・Metal gasoline tanks		
・Cross members		
Tires	2 companies	Goodyear
・Tires for vehicles		Firestone(Bridgestone)
Paints	2 companies	Corimon Pinturas Montana
・Paints for vehicles		Du Pont de Venezuela, C.A.
Exhaust systems	5 companies	C.A. Ven. De Tubos de Escape-silencialdores
・Exhaust systems		Fabrica de Silenciadores Fasil, C.A. "Fasilca"
assay (exlucing catalysts)		Industrias Doker, S.A.
		Metur,C.A.
		Tubotecnica, C.A. "Tuteca"
Brake systems, suspentions, power trains	13 companies	Amortiguadores, S.A.
・Shock absorbers		C.A. Danaven Division Ejes y Cardanes
・Springboards		C.A. DANAVEN Division Forjas
・Suspention bars and/or arms		C.A. Danaven Division Ejeven
		C.A. Danaven Division SH Fundiciones
・Cardan joints (universal joints)		C.A. Danaven Division Sistemas Modulares
・Axle shafts		Gabriel de Venezuela, C.A.
・Brake disks		Hayes Wheels de Venezuela, C.A.
・Differential shafts		Light Alloy Productos, C.A."Lapca"
・Front axles (uniform joints)		Metalurgica Carabobo, C.A."Metalcar"
		Resortes Sudamericnos, C.A. "Resudca"
・Coil joints		Ruedas de Aluminio, C.A. "Rualca"
・Propeller shafts		Echilin de Venezuela, C.A.
・Suspention modules		
・Steel wheels		
・Cannon wheels for large trucks		
・Brake drums		
・Aluminum wheels		
Tubes, hoses	3 companies	Rubber Products,C.A.
・Engine/radiator hoses		TI Group Automotive Systems

TABLE 3.1.19 LIST OF LOCALIZED PARTS AD COMPONENTS, AND SUPPLIERS (2/3)

Automotive parts		Part makers
・Hoses for heaters		Tuboauto,C.A.
・Hard pipes for brakes		
・Flexible hoses for brakes		
・Hard gasoline pipes		
・Flexible gasoline pipe		
・Hard clutch pipes		
・Cooling pipes for air-conditioners		
Interior, plastics	8 companies	3A Johnson Controls Andina, C.A.
・Floor mats		Altensa Fabrica de Alfombras,S.A.
・Seats and accessories		Autopartes Nacionales,C.A.Autoparna
・Safety belts		Autotex de Venezuela,S.A.
・Wheel caps		Lear de Venezuela,C.A.
・Rearview mirrors		Manufacturas Enveta,C.A.
・Door panels/planks, cardboards		Soaz Sanchez y Cia, C.A.
・Roof panels		Venezolana ㄱ Faros,C.A. ”Venefaros"
・Floor mat covers		
・Radiator reservoirs		
・Window washers Reservoirs		
・Sun visors		
Safety trinagle reflector		
Lamps		
Safety glass	2 companies	Inveca Pittsburgh,C.A.
Windows shield glass		Vidrios VenezolanosExtra,C.A.”Vivex”
Window glass		
Rear window glass		
Supplemental 1	1 company	
(Items for which localization has been discontinued)		
a. Items that can be localized with existing equipment		
Safety and acoustic electronics modules		
Brake hoses		
Door/glass opening/closing regulators		
Instrumentation panels		
Roof panels		
b. Items that can be localized with capital investment in the mic		Delta Industrial,C.A.
Alternators and accessories		
Starters and motors		
Window wiper motors		
Horns		
Supplemental 1	18 companie	Akron Gomas de Venezuela,S.A. E.M.A.
(Markets for replacement parts)		Bombonas Venezolanas.C.A. ”Bomveca”
Aluminum pistons		C.A.Danaven Division Perfect Circle Pistones
Engine gaskets		C.A.Danaven Division Sealing Products
Oil,air, gasoline filters		C.A.Danaven Division Wix
		Corporacion Venezolana de Filtros,C.A.”Covefilca”
Caps		Venezolana de Filtros,C.A.”Venfil”
Replacement lamps		Epecuen de Venezuela,C.A.
Replacement packings		Filtros Venezolanos,C.A.”Fivenca”
Clutch/brake pads		Frenos Venezolanos,C.A.”Frenosven”
Engine valves		Fundicion del Centro,C.A.
		Gagocar,C.A.
		Industria Victoria,C.A.”Ivica”
		Mamusa
		Plasticos Area,C.A.
		Polimeros del Centro, C.A.
		Valvulas Venezolanas,C.A."Valvenca"
		Induteca
	82 companies	

TABLE 3.1.19 LIST OF LOCALIZED PARTS AD COMPONENTS, AND SUPPLIERS (3/3)

Automotive parts	Part makers
Note: The folowing suppliers appear to have the ability to compete in the domestic market	
・DANAVEN	Power trains, press parts and others (diversification)
・Inveca Pittsburgh, C. A.	Glasses
・VIVEX	Glasses
・Goodyear	Tires
・Firestone	Tires
・Rualca	Aluminum wheels
・FAACA Group	Air conditioners, fuel tanks and lamps
・Du Pont de Venezuela	Paints
・3A Johnson Control Andina S. A.	Interior parts

Source: FAVENPA, JICA Study Team

3.2 Plastics Industry

3.2.1 Current state of the plastic resin industry in Venezuela

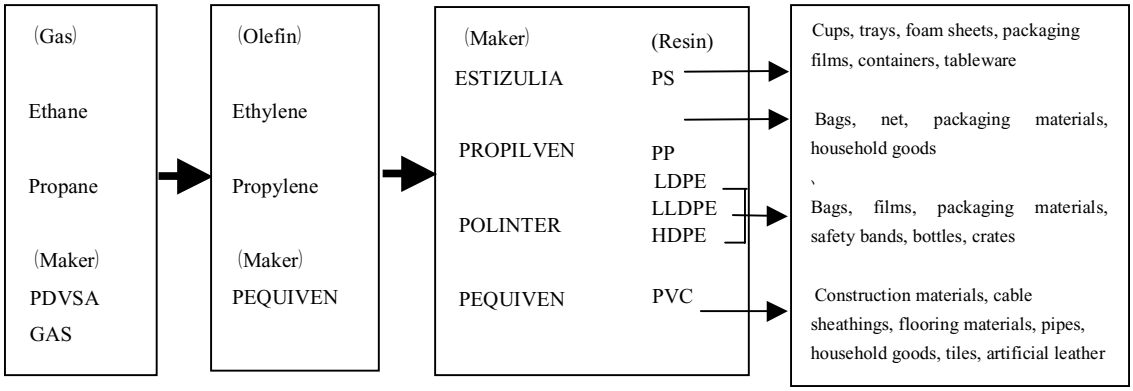
(1) Structure of the plastic resin industry

1) Industrial structure and domestic demand

a. Olefin/plastic resin chain

Olefin is the generic name for ethylene, propylene and other chemical products, from which synthetic resins (derivatives) are produced, generally referred to as plastic resin. Plastic resins are further processed into plastic molded products.

The olefin/plastic resin chain refers to a series of production processes to make olefin from petroleum gas (associated gas produced from crude oil), then polyethylene resins and plastic molded products.



b. Plastic resin demand

Major materials for plastic transformed products made in Venezuela include PVC resin[1], Polyolefin resin (LDPE[2], HDPE[3], LLDPE[4], PP[5]), PS resin[6], as well as other imported plastic resins[7]. Domestic demand has been on the decline across the product lines due to the economic recession in the recent few years and increasing

[1] PVC: **P**oly **V**inyl **C**hloride resin
[2] LDPE: **L**ow **D**ensity **P**oly **E**thylene resin
[3] HDPE: **H**igh **D**ensity **P**oly **E**thylene resin
[4] LLDPE: **L**inear **L**ow **D**ensity **P**oly **E**thylene resin
[5] **P**oly **P**ropylene resin
[6] PS: **P**oly **S**tyrene resin
[7] ABS、AS、PET、PC、Unsatulated polyester

competition from low price products imported from neighboring countries. Demand for PVC and PP has been growing slightly on account of government-aided housing construction and other public projects that were started in the latter half of 2000.

Annual domestic demand for plastic resin dropped from 360,000 tons in 1995 to 300,000 tons in 1999. It grew to 325,000 tons in 2000, equivalent to the 1997 level. Demand consisted of PE (LD, LLD, HD) 52.3%, PP 20.3%, PVC 17.2% and PS 7.7%. In particular, PVC demand went back to the 1998 level in 2000. (Table 3.2.1)

TABLE 3.2.1 APPARENT YEARLY CONSUMPTION OF PLASTIC RESIN IN VENEZUELA

(units : 1,000t/y)

Year	1994	1995	1996	1997	1998	1999	2000
PE (HD, LD, LLD)	123.7	178	169	175	196	160	170
PP	51.5	41	57	56	57	66	66
PVC	61.9	87	72	60	55	41	56
PS	30.0	36	31	27	25	25	25
Others*	9.8	20	11	9	8	8	8
Total	276.9	362	340	327	341	300	325

Note: Data of year 1997～2000 were estimated by JICA team.. Others (ABS、AS、PET、PC)
Source：AVIPLA based on data supplied by ASOQUIM.

2) Plastic resin manufacturers and ownership structure

a. Major manufacturers of olefin and plastic resin

Table 3.2.2 lists manufacturers of polyethylene (HDPE, LDPE and LLDPE) and ethylene as raw material, those of polypropylene (PP), those of PVC and raw materials, distributors, R&D organizations, and other key enterprises, which belong to the PDVSA group, including major product lines, production capacities and ownership structure. At present, their production volumes have not reached international levels.

TABLE 3.2.2 MAJOR PETROCHEMICAL COMPANY AND ITS PRODUCTION CAPACITY, PARTNER'S SHARE %

(Notes：MT/Y:metric ton per year)

Company	Products／capacity (1,000 MT/Y)		Partners / share %	
Olefinas del Zulia	Ethylene Ⅰ	350	PEQUIVEN	40.67
	Propylene Ⅰ	150	Financial Partners	59.33
Cloro Vinilos del Zulia	Chlorine	120	PEQUIVEN	48.29
	Caustic Soda	135	Financial Partners	51.71
	Ethylene Dichloride(EDC)	260		
	Vinyl Chloride Monomer(VCM)	130		
	—PVC Ⅱ (Suspension process)	120		
	—PVC Ⅰ(Dispersion process)	60		
Polinter	(PE・HD,LD,LLD)		PEQUIVEN	46.10
	High density Polyethylene	100	Grupo Zuliano	20.00
	Low density Polyethylene	85	IPHL	17.61
	Linear Low density Polyethylene		Sofilago	13.72
	/High density Polyethylene	210	Mitsui	1.59
	(LLDPE ＆ HDPE swing process)		Cetic	0.98
Pralca	Ethylene Oxide(EO)	16	PEQUIVEN	46.10
	Ethylene glycols(EG)	66	Corimon	10.00
			Olin corpolation	25.00
			IFC	10.00
Propilven	Polypropylene (PP)	84	PEQUIVEN	49.40
			Grupo Zuliano	17.80
			Promotola Veneco	17.80
			Mitsui	15.00
Coramer	Plastic Marketing Unit		PEQUIVEN	33.33
			Polinter	33.33
			Servicios Propilven	33.33
INDESCA	Research and Development		PEQUIVEN	33.33
			Estizulia	33.33
			Polinter	33.33

Source：PEQUIVEN Activities Report 1999,2000

(Polystyrene manufacturers) These companies are listed separately because they do not belong to the PDVESA group.

Company	Products／capacity (1,000 MT/Y)		Partners / share %
Estizulia	Polystyrene	48	100
Estizulia ServiciosTecnicos,C.A.	Customer services ＆ Marketing		100

Source ： Guide book of Estizulia, PEQUIVEN Activities Report 1999

3) Plastic resin production and exports

In 2000, total production of major plastic resins (PE, PP, PVC and PS) reached 542,000 tons, of which 47.5%, or 257,000 tons were exported. Domestic supply amounted to 317,000 tons, including 33,000 tons of imports. Note that domestic demand for plastic resin includes approximately 10,000 tons of imported special plastic resin, which is not included in the table. Plastic resin exports as percentage of production are 45% for PE, 15% for PP, 60% for PS, and 72% for PVC, with the overall average share of 48%. (Table 3.2.3)

TABLE 3.2.3 PRODUCTION AND EXPORT BALANCE IN YEAR 2000

(Unit : Tons/year)

Resin type	Operation	Export (%)	Import	Domestic supply
Polyethylene (PE)	312,000	141,701 (45.4%)	—	170,299
Polypropylene (PP)	77,280	11,246 (14.6%)	—	66,034
Polystyrene (PS)	48,000	29,200 (60.8%)	6,200	25,000
PVC	104,400	75,300 (72.1%)	27,000	56,100
Total	541,680	257,447 (47.5%)	33,200	317,433

Source: MPC, AVIPLA

Domestic demand for polyethylene resin remained at around 170,000 tons annually, with the peak level of 196,000 tons in 1998. (Table 3.2.4) Annual exports amounted to 160,000 tons after 1996, with the peak level of 195,000 tons in 1999. The percentage of exports reached 45%.

TABLE 3.2.4 PRODUCTION-IMPORT-EXPORT BALANCE OF POLYETHYLENE RESIN

(Unit: Metric Ton)

	1994	1995	1996	1997	1998	1999	2000
Production	165,750	222,777	298,363	330,661	351,209	355,171	312,000
Domestic sales *3	123,705	176,830	166,463	171,005	191,171	154,493	170,299
Imported *1	0	7,992	3,009	3,623	4,829	5,392	6,550*
Exported *2	42,045	37,955	128,891	156,003	155,209	195,286	141,701
Expt%to Production	25.4	17.0	43.2	47.2	44.2	55.0	45.4
Real domestic Consumption	123,705	184,324	169,472	174,628	196,000	159,885	176,849

*1 ,*2: Statistic data of import & export. *3: Data is estimated by JICA team.
Source: MPC data & JICA team estimate.

Of 141,700 tons of polyethylene exports in 2000 (Table 3.2.4), 63,500 tons (45%) were destined to Colombia and Brazil (Table 3.2.5). PE (HD and LD) accounted for 78% of exports to Colombia, while exports to Brazil were mostly PS and PVC, 95% of total (17,000 tons). PE exports to Brazil were very small (2.4%) due to local production. PS and PVC exports to Colombia amounted to 16,000 tons each, accounting for 20% of total exports to the country.

TABLE 3.2.5 EXPORT OF POLYETHYLENE RESINS TO COLOMBIA & BRAZIL (2000)

(unit : t/y, %)

	Colombia	% Balance	Brazil	%Balance	Total	% Balance
PE (HDPE)	29,933	37.3%	323	1.8%	30,256	30.8%
PE (LDPE)	33,219	41.4%	74	0.4%	33,293	33.9%
PP	958	1.2%	376	2.1%	1,334	1.4%
PS	8,172	10.2%	8,551	47.0%	16,723	17.0%
PVC	7,870	9.8%	8,870	48.8%	16,740	17.0%
Total	80,152	100.0%	18,194	100.0%	98,347	100.0%

Source : MPC, AVIPLA

Plastic resins used for production of plastic transformed products (e.g., PE, PP and PVC) are internally traded commodities, subject to intensive price competition in the export market. The current level of production volume in the country is fairly small and most production plants require renovation. If they are not renovated soon, they will lose price competitiveness for petrochemical products and plastic resins (e.g., PE, PP, PVC) made by PEQUIVEN. If exports decline due to competitive pressure, PEQUIVEN will face financial difficulty as its sales rely much on exports (45% of production). Then, government revenues will be adversely affected and the domestic plastic transformation industry will deteriorate. In fact, price competition for petrochemical products is intensifying worldwide. Petrochemical investment plans in Venezuela are summarized as follows.

According to PDVSA's ten-year plan announced in February 2000, PEQUIVEN Group will invest $8.7 billion, of which 55% will come from the private sector and 45% from the government. In addition, the private sector is expected to make capital investment amounting to $500 million. Furthermore, the petrochemical industry plans to spend $3 billion to boost natural gas production in response to potential demand. The following table summarizes petrochemical projects that are jointly undertaken with foreign companies and are scheduled to come on stream between 2004 and 2008.

Projects scheduled to come on stream in 2004	Ethane	··· Gas for ethylene production	1,380,000 tons/year
	Ethylene	··· PE material	1,000,000
	Polyethylene	··· Plastic resin	780,000
	Polyethylene Gricol and others Ethylene derivatives		400,000
	Acetic acid	··· Ethane derivatives	500,000
	Styrene	··· Material for PS production	500,000
2006	Polypropylene	··· PP resin	250,000
2008	Cyclohexane	··· Styrene material	250,000

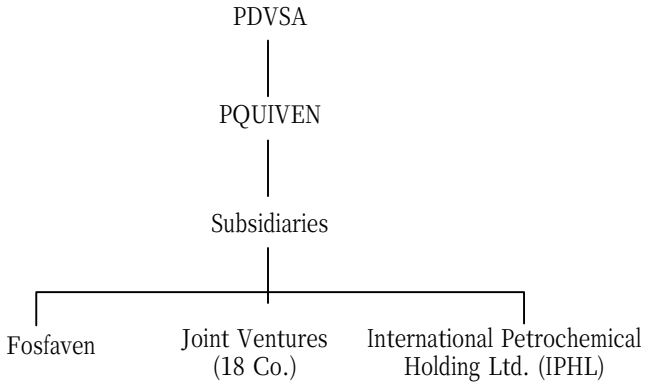
In fact, these projects will be all built and operated in the Jose Complex, which plans to establish an integrated production system for major plastic resin products. It will use natural gas as a principal raw material, as seen in similar complexes planned in the Middle East, and intends to produce ethylene, polyethylene and other basic products with world-class price competitiveness. The Jose Complex, when completed, will become the largest petrochemical complex in South America and serve as a major source of supply for a variety of materials for resin production.

Once it starts commercial operation, the complex will have to establish an efficient production management system in order to ensure plant operation at capacity. At the same time, vigorous marketing efforts are required to stimulate domestic demand for plastic resin and exploit export markets.

4) Supply of plastic resin

In Venezuela, petrochemical products are mainly manufactured and marketed by PEQUIVEN and its group companies. PEQUIVEN, in turn, is a subsidiary of PDVSA (Petroleos de Venezuela, S.A.), an oil enterprise established by the Venezuelan government. It has three petrochemical complexes (El Tablaze in the west area, Molon in the central area, and Jose in the east area), an aromatic plant, port facilities, and phosphate mines. It operates three principal businesses, olefin and plastics, fertilizers, and industrial products. It has established 18 petrochemical joint ventures with domestic or foreign partners (Figure 3.2.2), of which 17 are located in Venezuela and 1 in Colombia.

FIGURE 3.2.1 SHAREHOLDING STRUCTURE OF PEQUIVEN



Source: PEQUIVEN Activities Report 1999

As for plastic resin production, PEQUIVEN produces PVC, Polinter LDPE, HDPE and LLDPE, Propilven PP, and Estizulia PS. Note that Polinter and Propilven are included in the eighteen joint ventures, while Estizulia is not a company with equity participation of PEQUIVEN.

Current production capacities for polyolefin and polyvinyl chloride resins, capacity utilization rates, and actual production volumes are shown in Table 3.2.6. Capacity utilization rates for PE and PP are maintained at relatively high levels, 80% and 92% respectively, thus helping to reduce production costs. The high capacity utilization rates are the result of government policy to encourage exports in order to compensate for the small domestic market. On the other hand, the low operating rate for PVC capacity reflects the fact that capacity expansion has been made very recently (at the end of 1998) and it will rise as export drives produce results.

TABLE 3.2.6 CAPACITY UTILIZATION FOR PRODUCTION OF PVC, PE, PP

(Unit：MT/y・1,000 tons, 2000)

	Capacity MT/Y	Production MT/Y	Capacity Utilized %	Exported MT/Y	Domestic* Supplied MT/Y
Policloro de Vinilo (PVC)	180,000	104,400	58	75,300	29,100
Polietilino (PE)	395,000	312,000	80	141,700	170,300
Polipropilino(PP)	84,000	77,280	92	11,246	66,034
Poliestireno(PS)	48,000	48,000	100	29,200	18,800

Source：： ASOQUIM, MPC and others

＊：Total supply for domestic includes imported plastic resin.－

Nominal production capacity is LDPE 100,000 tons, HDPE 85,000 tons, LLDPE 210,000 tons, and PVC 180,000 tons. To improve international competitiveness, it is imperative to boost polyethylene production capacity and increase production of ethylene as a principal raw material. In fact, ethylene plants worldwide have been rushing to capacity expansion since 1999. In Venezuela, capacity expansion projects are also underway, slated for completion in 2004. Total investment reportedly amounts to $2.6 billion, including ethylene capacity of 1 million tons and polyethylene 780,000 tons at the Jose Complex.

a. HDPE production

The plant has introduced HDPE production technology under the license agreement with Mitsui Petrochemical Industries, Ltd., in April 1979 and August 1984. Major HDPE products are resins for high strength films and very thin films

suitable with good workability for molding. The current production capacity is 100,000 tons per year.

b. LDPE production

For LDPE production, an autoclave production system (50,000 tons per year) was purchased from Enichem of Italy in 1976. Then, production capacity was added to 85,000 tons.

c. LLDPE production

An LLDPE plant (150,000 tons per year) was built by Du Pont of Canada in 1995. The plant capacity was thereafter increased to 190,000 tons, then 210,000 tons (nominal) as of the end of 1999. The plant is capable of producing HDPE and LLDPE according to demand, called the swing process. At present, the capacity utilization rate is relatively low and the plant presumably faces heavy financial burdens on amortization and higher production costs. Some plastic transformers wish to purchase LLDPE of different quality.

d. PP production

The polypropylene plant introduced the Hypor process technology from Mitsui Petrochemical Industries in the 1980s. The current production capacity is 84,000 tons per year. Mitsui Petrochemical Industries Ltd. has been licensing the PP and HPDE process technologies worldwide, which are reputed for stable productivity and high quality. Polypropylene made by the plant is shipped to plastic transformers without quality problems.

e. PVC production

A new plant was completed at the end of 1999, with an annual production capacity of 120,000 tons. Total production capacity including the older plant reaches 180,000 tons. The new plant uses the suspension method that is most widely adopted worldwide. The older plant is not capable of making products of consistent and acceptable quality, and many plastic transformers imported from Colombia and other countries.

f. PS production

PS production is carried out by a resin manufacturer that is entirely owned by private capital, without equity participation of PDVSA, because PDVSA does not

produce a PS material. The current production level is 48,000 tons per year, which is smaller than the world standard.

Domestic demand for polystyrene is small. It once reached the peak level of 36,000 tons per year and dropped to 25,000 tons in the recent few years. To maintain the competitive cost, the company operates the plant at capacity and exports surplus production (48% of total) to keep business going. On the other hand, some plastic transformers import from Dow Chemical the types of PS products that are not available locally.

(2) Current state of plastic resin industries in neighboring countries

1) Mexico

PEMEX, a national oil company, exclusively produces basic materials for petrochemical production in the country. However, the capacity utilization rate in the petrochemical sector has been falling in the recent years, 72.6% in 1997 and 60.8% in 2000. Similarly, ethane consumption remains low at 50% of production and commercial use of associated gas has not expanded significantly.

Under these circumstances, the percentage of crude oil supply to the petrochemical sector dropped from the peak level of 8.5% in 1991 to 5.2% in 1999 and 4.2% in 2000. Production of plastic resin declined across the major project segments in 2000, ethylene down 9.2% (1,050,000 tons), HDPE 6.1% (155,000 tons), LDPE 14.6% (249,000 tons), and PVC 6.7% (168,000 tons). Imports of petrochemical products grew rapidly in 2000 partly due to sluggish production by PEMEX, up 180% to $72 million. The manufacturing sector in the country strives to secure natural gas supply in order to meet growing demand and supply products at internationally competitive prices. It is now demanded to cut industrial gas prices by 25%. If the present situation continues, the petrochemical industry will further lose international competitiveness.

Although no announcement has been made on actual plan or project, the industry intends to focus its capital spending on capacity expansion and rationalization to ensure the effective use of resources. In 2000, four chemical companies established a joint venture specialized in electronic commerce of chemical products (Quiminet, S.Ade C.V.) for the purpose of streamlining product distribution networks. This is

reportedly the first e-commerce company handling chemical products in Latin America.

2) Brazil

In 2000, the Brazilian economy bottomed out of recession and domestic demand showed a solid recovery. Meanwhile, the rise in crude oil price pushed up prices of petrochemical products. For instance, naphtha prices jumped 15% from $200 per ton in early 2000 to $230 in June. As a result, domestic ethylene prices rose 8% and resin prices increased 6.2%. The plastics industry enjoyed growing demand for PP resin (automobile industry), PS (household appliance), LDPE (communication cable sheathings and detergent containers), and PET (soft drink bottles). According to the trade association, ABIQUIM, the industry will spend $5.5 billion for production of industrial chemicals over six years started in 2001. A state petrochemical company, Petrobras, plays an important role in production of raw materials for the petrochemical industry. At present, it is building, jointly with two private companies, the first ethylene plant in Brazil to use natural gas in Rio de Janeiro. The 500,000-ton plant will come on stream in 2004. Copene has announced a plan to increase its ethylene capacity from 300,000 tons per year to 1.5 million tons in 2003.

3) Argentina

The country's economy was hit hard in 1998 and 1999 by the Russian crisis and the devaluation of the Brazilian currency. Petrochemical production in 2000 declined 6.9% for the first ten month period (January – October) as compared to the same period a year ago. However, some of petrochemical materials and transformed products showed healthy growth, e.g., plastic materials and rubber 12.7%, tire 8.0%, polyethylene resin 3.0%, and polyvinylidene chloride 81.1%. In fact, these production increases partly come from the ongoing plan to boost production at petrochemical complexes, generally referred to as the "Mege Plan." The plan is based on expansion of natural gas supply and has successfully increased ethylene production from 275,000 tons to 700,000 tons per year, and polyethylene production from 260,000 tons to 650,000 tons. Meanwhile, foreign companies show strong interest in making investment in the petrochemical and plastics sectors. In 2000, foreign investment totaling $280 million is expected as new projects. U.S. companies will have a dominant share of 79% probably because investment decisions are closely associated with MERCOSUR. Between chemical industries in Argentina and Brazil, strategic alliances and mutual investment are on the rise. As a result,

trade of chemical products between the two countries will continue to expand in the future.

3.2.2 Current state of the plastics industry in Venezuela and major issues

(1) Current state of the plastics industry

1) Production

The plastics industry accounted for approximately 0.6% of GDP in 1998 and 1999. It represented 15% of the manufacturing sector and 1.6% of the chemical and petrochemical industries including plastic transformers. (Table 3.2.7) According to AVIPLA 2000, the capacity utilization rate of the plastics industry remains at around 43%. If the rate is doubled, the industry's share in GDP will exceed 1%.

TABLE 3.2.7 GDP AND PLASTIC TRANSFORMING INDUSTRY

(unit: 1 million Bolivar)

	1998	% GDP	1999	% GDP
Total GDP	587,023	100.0	551,971	100.0
Manufacturing industry	87,863	15.0	79,771	14.5
Chemical, petrochemical industry,	9,665	1.6	8,775	1.6
Plastic transforming industry	3,500	0.6	3,300	0.6

Source：ASOQUIM、BCV、AVIPLA2000

2) Number of enterprises and employment

According to AVIPLA 2000, the plastics industry showed declines in all indicators between 1997 and 1999, including employment, the number of enterprises, the capacity utilization rate, and export ratio. (Table 3.2.8) In particular, employment has decreased steadily in the 1990s, from 24,862 in 1990 to 17,716 in 1997 and then 13,048 in 1999. The average rate of decrease is 7% and the pace accelerated in the recent three years, 14.2% per year.

According to CONINDUSTRIA[8]s survey of 350 enterprises in each industry sector, 29% of the plastic transforming industry increased employment between June and December 2000 and 28.5% responded no change. For all industries, 40% of enterprises indicated decreases in employment. Other indicators also suggest that the plastic transforming industry has been enjoying better business conditions since 1999; 54.9% of enterprises increased the capacity utilization rate and 22% reported sales growth.

[8] CONINDUSTRIA: Encuesta de coyuntura incustrial (2do Semestre 2000)

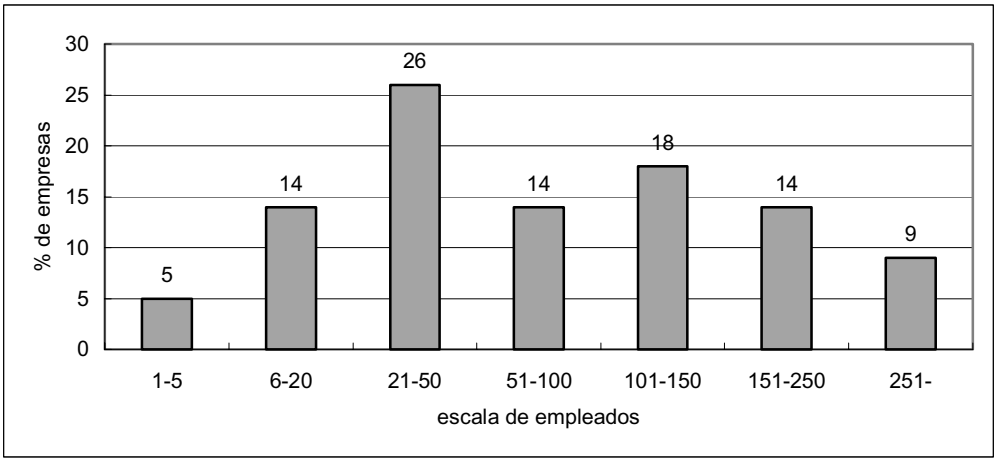
TABLE 3.2.8 RECENT STATUS OF PLASTIC TRANSFORMERS

Year	Unit	1997	1998	1999	Annual Rate of Change
Number of employees	Person	17,716	15,293	13,048	－14.18%
Number of enterprises	Number	289	272	245	－ 7.93%
Production rate on tranformer	%	46.7	44.3	42.6	------
Export ratio of production	%	12.5	10.45	5.81	------

Source：AVIPLA 2000

As for employment per enterprise, 25% of enterprises in the plastic transforming industry have 21-50 employees and nearly 80% have less than 150 employees. Thus, the industry is dominated by small- and medium-sized enterprises.

FIGURE 3.2.2 PERCENT OF TRANSFORMING FACTORY NUMBER AND ITS EMPLOYEES



Source: AVIPLA 2000

3) Value of production by the plastic transforming industry

According to AVIPLA, production of plastic transformed products has been steadily declining in the 1990s, e.g., 3.5 billion Bolivar in 1998 and 3.3 billion Bolivar in 1999. The average rate of decline during the decade is 5.5%. (Table 3.2.9)

TABLE 3.2.9 TOTAL PRODUCTION OF PLASTIC TRANSFORMING INDUSTRY IN VENEZUELA

(unit：Billion Bs)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Production	5.5	5.0	4.8	4.6	4.7	4.3	4.2	3.5	3.3

Source：AVIPLA 2000

Similarly, the capacity utilization rate of the industry has been declining year after year. It dropped to below 50% in 1996 and reached 44.3% in 1998 and 42.6% in 1999. The industry thinks that the low rate represent export capacity.

17 enterprises in the plastics sector visited by the study team are classified according to employment and plastic resin consumption, as shown below.

TABLE 3.2.10 ENTERPRISES VISITED, EMPLOYMENT AND RESIN CONSUMPTION

Plastic resin consumption	No. of employees	No. of enterprises	%
1,000 tons/year or less	50 or less	2	12
1,001～2,000	50～80	5	29
2,001～4,000	80～150	7	41
4,000 or over	120～200	3	18

Source：JICA Study Team

Notably, among large enterprises employing 150 workers and consuming 4,000 tons of resin per year, consumption per employee is relatively small, ranging between 20 and 30 tons. The figures are far below comparable data in Japan, in the range of 80 - 120 tons. If a high value added product is made, small resin consumption per employee will not affect business viability. However, plastic transformers in Venezuela make low value added products and must face difficulty as judged from the very small amount of resin consumption.

4) Geographical distribution of plastic transformers

80% of plastic transformers in the country are located in the central area, 16% in the west area, and 2% in the east area. (Table 3.2.11) Within the central area, 37% of all the enterprises operate in Miranda and 19% in the Caracas metropolitan area. Thus, majority of plastic transformers are located in these two areas.

TABLE 3.2.11 GEOGRAPHICAL DISTRIBUTION OF PLASTIC TRANSFORMERS

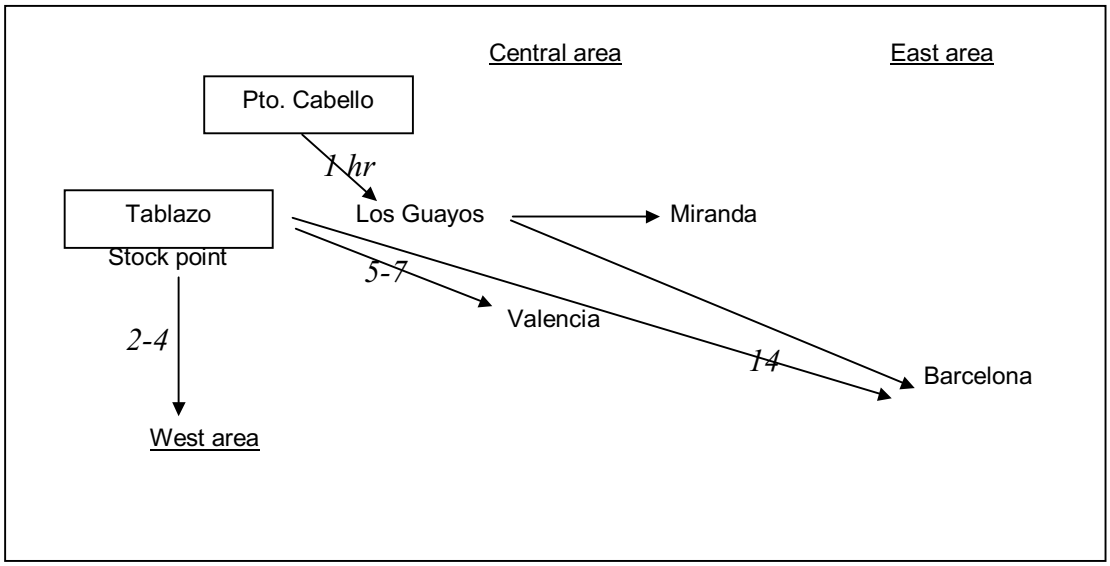
West District	%	Central District	%	East District	%
Lara	6	DTO Federal	19	Sucre	1
Zulia	7	Carabobo	14	Anzoategul	1
Merida	1	Aragua	12		
Tachira	2	Miranda	37		
West District	16%	Central District	82%	East District	2%

Source：AVIPLA information

Plastic transformers purchase resin materials from PEQUIVEN and its group companies. Plastic resin is shipped from a plant in Tablazo, Zulia.

Plastic resin is transported either to the central area on land or to Pto. Cabello via sea, then to Valencia, Caracas or other areas on land. Miranda is located in an east end of the central area and furthest from Tablazo (Figure 3.2.3) As shown in the figure, it takes 5-7 hours from Tablazo to the central area, and then additional few hours to Miranda.

FIGURE 3.2.3 GEOGRAPHICAL LOCATION OF PLASTIC TRANSFORMER (HOURS)



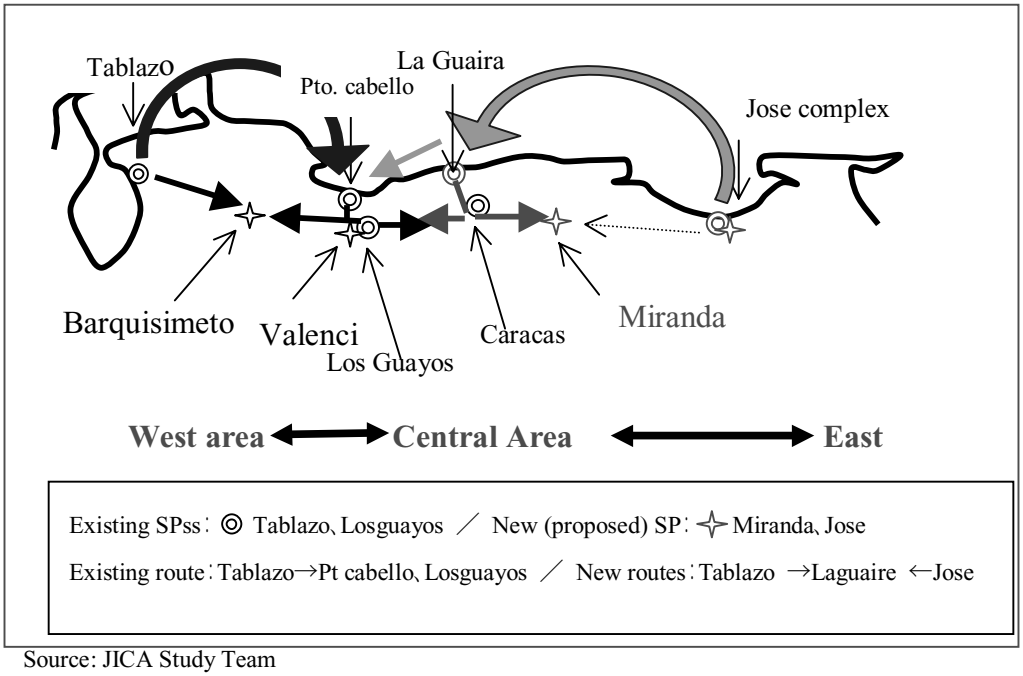
Source: MPC, CPRAMER & JICA Study Team

5) Physical distribution of plastic resin and transportation costs

Two plastic resin suppliers, Polinter and PEQUIVEN, have stock points (SPs) in Tablazo and Los Guayos. On the other hand, plastic transformers are distributed as shown in Table 3.2.11 (16% in the west area, 82% in the central area, and 2% in the east area). The suppliers deliver plastic resin to transformers and five distributors (see the table below) at the two SPs. When a customer takes delivery at the Tablazo SP, it must be responsible for transportation of plastic resin to its plant or other facility. Note that the price for delivery at the Los Guayos SP is approximately 3% higher than that at the Tablazo SP because an additional transportation cost from Tablazo to Los Guayos is required. Plastic resin is shipped from either SP to the customer's facility upon request and at the customer's cost. In terms of transportation cost, therefore, a customer located close to Tablazo is advantageous over the one located further.

After the Jose complex is completed in 2004, as scheduled, plastic resin will be transported from Tablazo and Jose. In particular, Tablazo will lose its importance and the Jose route will increasingly account for major portions of transportation. More precisely, once the Jose complex is completed, there will be two transportation routes to the central area, i.e., the La Guaire-Caracas route and the Jose-Miranda route. (Figure 3.2.4)

FIGURE 3.2.4 GEOGRAPHICAL LOCATION OF PLASTIC TRANSFORMER (LOGISTICS)



Source: JICA Study Team

To ensure smooth delivery of resin materials to plastic transformers that are located in various parts of the country, the SP in the central area (Los Guayos) is not sufficient and another SP should be provided in the east side of the central area. After the Jose complex is completed in 2004, it is desirable to operate four SPs (Tablazo, Los Guayos, Jose and the east side of the central area) so that the difference in transportation cost among transformers caused by distance from the SP will be reduced significantly.

(2) Plastic product markets

1) Product categories

Table 3.2.12 shows types of plastic products available in the domestic market, and those exported and imported. As seen in the table, three product categories - containers, packaging materials and construction materials – account for a combined share of 60%. In the import market, construction materials also hold a relatively large share, while foamed sheets and caps & lids account for 20% each, and bathroom goods and films & sheets 10% each.

TABLE 3.2.12 MARKET SEGMENTATION OF PLASTIC PRODUCTS IN VENEZUELA

Category	Domestic market*1	Category	Import %	Category	Export %
Containers	18	Films & sheets	12	Containers	18
Packaging	27	Adhesive sheets	11	Bags	11
Electronics	3	Foamed sheets	20	Crates	5
School goods	1	Caps & lids	24	Coolers	3
Hose	2				
Construction	16	Construction	19	Construction	17
Toys	2			Cans	4
Agriculture goods	1				
Medical goods	3			Brushes & Combs	2
Cages & baskets	7			Cages & Baskets	2
Geomembranes	2				
Household goods	7			Household goods	37
Bathroom goods	4	Bathroom goods	13		
Others	7	Others	1	Others	1
Total	100		100		100

＊1：Of those available in the domestic market, 75% are locally made and 25% are imported.
Source：AVIPLA

As for exports, household goods account for 37% of total, followed by containers and construction materials, which hold 17-18% each.

Note that these products are injection or extrusion molded. The three product categories account for 72% of plastic products, contributing greatly to exports. Comparing imported products and locally made ones, the former is largely seen in foamed sheets, caps & lids, and bathroom goods.

2) Domestic market

The local market for plastic transformed products in Venezuela is smaller than neighboring countries, such as Colombia and Brazil. In particular, the plastic transforming industry in the country cannot expect support from the three sectors that generate major demand for industrial products including plastics in industrialized countries. First of all, the country lacks the household appliance and consumer

electronics industries. There are suppliers that served the defunct household industry and have production equipment and skills to meet demand for the automobile and machinery industries, but these industries are relatively small and fail to create business opportunities for SMEs. The food processing industry – the third sector to consume industrial products in large quantities – does not have manufacturers of flexible packaging materials. As a result, production techniques that served the household appliance industry is currently used for injection molding of household products.

3) External trade

Trade balance with neighboring regional markets changed significantly during the three-year period after 1996, and trade deficits have been growing. The trade deficit with the Pact Andino expanded from 7 million Bolivar in 1996 to 240 million Bolivar in 1999. The trade deficit with MERCOSUR grew from 410,000 Bolivar to 400 million Bolivar during the same period. A trade deficit with other G3 countries (Mexico and Colombia) grew 60 times to 1,270 million Bolivar in 1999. (Table 3.2.13)

TABLE 3.2.13 IMPORT EXPORT BALANCE OF SUB-REGIONAL MARKET

(units : 1,000 Bs)

Subject	Import 1		Export 2		Balances 2 - 1	
Year	1996	1999	1996	1999	1996	1999
Pact Andino: COL,EQ,PEL,BOL	26,153	513,709	19,155	272,583	-6,998	-241,126
Mercosur:BZ,ALZ,PALG,ULG	2,305	1,194,070	1,892	769,427	-413	-424,643
G3 : MEXICO,COLOMBIA	29,643	1,452,838	16,963	843,074	-12,680	-609,764
Total	58,101	3,160,617	38,010	1,885,084	-20,091	-1,275,533

Source : AVIPLA & MPC

Rapid growth of trade deficits simply reflects the fact that imports have price competitiveness over domestic products and are widely sold in the domestic market. This is confirmed from the interview and questionnaire surveys conducted by the JICA study team.

Responses in the questionnaire survey

- Raw material prices are high to prohibit cost reduction : 33%
- Local products are losing customers to low-priced imports: 50%
- Local products lack competitiveness in the market: 33%

It should be noted that growth of imports is partly caused by the inability of local manufacturers to reduce production costs due to poor production techniques or the lack of equipment upgrading, which prevents productivity improvement or economies of scale. This means that local products cannot compete with imports by merely lowering resin prices to the international levels.

TABLE 3.2.14 SHARE OF PLASTIC TRANSFORMED PRODUCTS IN EXPORTS AND IMPORTS

Imports in 1996	Share (%)	Exports in 1996	Share (%)
Laminated sheets	19.8	Bags	25.4
Construction materials	13.9	Household goods	21.7
Foamed sheets	13.3	Laminated sheets	13.9
Caps & lids	9.6	Construction materials	7.0
Adhesive sheets	8.9	Caps & lids	5.9
Others	34.5	Others	26.1
Imports in 1999	Share (%)	Exports in 1999	Share (%)
Lids, caps and sheets	24	Household goods	37
Foamed sheets	20	Containers	18
Construction materials	19	Construction materials	17
Household goods	13	Baskets & bags	13
Films and laminated sheets	12	Brushes & combs	2
Adhesive sheets	11	Crates	5
Others	1	Others	8

Source: AVIPLA

Composition of plastic products in exports changed significantly between 1996 and 1999. Household goods grew from 22% to 37%, containers from 4.3% to 18%, and construction materials from 7% to 17%. In contrast, bags lost share rapidly from 25.4% to 11%, suggesting that they have lost export competitiveness.

Also, the 1999 export data include products that require sophisticated molding techniques to make, including brushes and combs, crates (casings for bottles) and containers. Although they hold relatively small percentages, increased exports of these high grade products indicate the shift in focus of the industry to high valued added products. On the other hand, growing exports of household goods, containers and construction materials indicate the results of market efforts to expand exports.

(3) Production of plastic products

1) Production equipment

Most production equipment owned by SMEs in the plastic product sector is deteriorated due to aging. Of the selected 20 SMEs that were visited by the study team, only 5 companies (25%) own new equipment and other 15 companies use old equipment that has been for more than 20 years. New equipment owned by the five companies is limited to one or two units per company and the rest of equipment is fairly old. However, slightly over 30% of enterprises that responded to the questionnaire survey cited old equipment as a major problem facing them. This reflects the fact that the current capacity utilization rate is low and most SMEs believe that high quality products are not demanded by the domestic market.

From the viewpoint of improving cost competitiveness of products, old equipment has disadvantages in terms of quality, productivity, production stability, yield and other aspects. Thus, it is imperative to upgrade production equipment as early as possible in order to ensure competitiveness of SMEs in the plastic transforming industry.

2) Production technology

Many SMEs in the sector have production technology that is far below world standards. They have to realize importance of quality, cost and on-time delivery if they are to survive through intensive competition in the international market. Then, they have to analyze and identify their strategic direction in the context of world trends, and select and execute an optimum strategy. In reality, only a few companies move strategically and many others have still to find where they should go. The results of the questionnaire survey indicate that more than 30% of respondents cited low productivity (33%) and low levels of production technology (33%).

At present, few SMEs in the country are capable of analyzing their own strengths and weaknesses, opportunities and threats (SWOT), positioning in the market, human resources, and production capacity and capability, and preparing a plan to improve operation and management by setting priority to strategic options and actions available to them. SMEs have a number of opportunities to produce immediate results, including field efforts to improve quality, reduce loss, eliminate wasteful activities in the production process, and other efforts on the shop floor. In this connection, there

seem to be the strong needs for education and training of senior workers and foremen to teach techniques and skills required for such efforts.

3) Production management

Many SMEs in the plastics sector need to modernize production management. In particular, they have to establish an organization capable of executing day-to-day production management activities according to the size of operation.

The results of the questionnaire survey indicate 33% of respondents cited the production management system as a major problem. This seems to reflect the fact that many enterprises believe that their products satisfy the market needs. At BID-COINDDUSTRIA's case study seminar on the upgrading of SMEs, it was pointed out that "Venezuelan companies face limitation in improving cost competitiveness as their production capacity is smaller than those in Europe and the U.S. Thus, they will not be able to differentiate their products unless they improve product quality and service." Generally, SMEs need to tackle the following problems related to production management in order to attain international competitiveness:

- Production planning and updating/market-in: The sales department fails to understand customers' needs.
- Field quality control: Few foremen and supervisors are capable of assuming leadership in quality control initiative.
- Product quality design: Lack of understanding on the needs for sales information, market-in and quick action

4) Supply of raw materials and quality

The results of the questionnaire survey indicate that SMEs feel uncertainty about raw materials in the following respects:

Price volatility of locally available materials	100%
Unreliable delivery schedule	33%
Instable quality (PVC)	33%

Nevertheless, these negative factors are expected to improve in the near future, for the petrochemical industry in Venezuela will improve supply capabilities through 2004. Also, the business environment will become more favorable for SMEs in the plastics sector as the government's economic promotion policy will take effect and inflation begins to subside.

The quality problem related to PVC stems from a new facility that was added at the end of 1999 and is being improved.

The most important problem for SMEs, however, is the inability to purchase raw materials due to a small amount consumed by a single company. Or the purchase price becomes much higher than a standard unit of purchase, and SMEs often feel difficulty in financing the purchase due to poor credit rating.

One solution is the collective purchase of raw materials through a cooperative established by a group of SMEs. This permits them to enjoy a lower price applied to volume purchase, while obtaining raw materials in small quantities. The first cooperative was already established in Aragua. CARPA has the membership of 47 companies and purchased 1,800 tons monthly for three months after the establishment.

Collective purchase record	(Month)	(purchased)	Average purchased
	April/2001	1,092,000 kg	21.8 kg
	May/2001	1,254,750 kg	25.1 kg
	June/2001	1,551,950 kg	31.0 kg
	July/2001	1,760,400 kg	35.2 kg
	August/2001	1,752,375 kg	35.0 kg

As the collective purchase arrangement offers clear advantages for SMEs, government support is imperative to promote the establishment of similar cooperatives in other areas. As trade liberalization will progress further in the near future, sourcing of raw materials may be expanded to the international market, in addition to local suppliers. This will help plastic transformers to obtain the leadership in determining purchase prices for plastic resin materials.

(4) Sales of plastic products

1) Sales and distribution costs

The physical distribution system in Venezuela is not well developed. Most SMEs own trucks to transport raw materials and products. While larger SMEs operate a relatively efficient transportation system using large trucks, most SMEs cannot expect efficient transport as their loads vary from time to time. Mixed loading, similar to collective purchase of raw materials, is difficult to operate as judged from experience

in Japan, due to various conflicts of interest that prevent the objective of achieving cost reduction and a high load factor per truck. It is therefore reasonable to conclude that the collective transport system is not viable under the membership of 230 SMEs in the plastics sector. A workable solution is to organize a larger number of companies, including those in other industrial sectors, to form a cooperative that can generate sufficient demand.

2) Inventory management and cost

A manufacturer visited by the study team holds sizable product inventories and delivers a truckload of products that are ordered by the customer, using a large truck. The company believes that ample inventories allow them to assure quick delivery to customers and thus minimize opportunity loss that may be suffered from the lack or shortage of inventory. While this strategy can create economies of scale and bargaining power in materials procurement, it incurs considerable inventory costs because interest rates are very high in the country.

The company makes household goods that are the largest product segment in the country and that rank high in export to and import from neighboring countries. Large inventory of these products may turn to waste if consumer taste changes or demand declines.

To minimize the inventory cost and various risks associated with excess inventory, it is desirable to control inventories of both raw materials and products at around one month. To do so, a detailed production plan must be established with an accurate delivery schedule, which must be ensured by good production management and a reliable production system. Such production system is in turn supported by a flexible procurement system to purchase raw materials on demand and in a small lot. The collective purchase system is best suited to the purpose.

(5) Other

1) Education and training

Majority of managers of companies visited by the study team pointed out the shortage of skilled workers (foremen). Japanese companies also faced this problem and took various measures to secure required skills, such as the use of outside training service, technical advisors from parent companies, and recruitment of experienced workers.

In the questionnaire survey, 60% of companies cited the lack of training facilities for foremen-class workers as a major problem. In Venezuela, SEFORME (Valencia) previously conducted a training program on plastics processing. The program was terminated at the end of 1999 due to financial difficulty. In May 2002, a new educational institution, CEDEA (Aragua), will be inaugurated as a joint project of the public and private sectors. It will offer training courses on plastics.

Also, Under PDVSA, there is a private organization, CIED, specialized in technical education in the chemical and petrochemical fields. It primarily provides education and training for workers and managers of PDVSA and chemical and petrochemical companies, not particularly benefiting plastic transformers. Finally, INTEVEP, a research and development organization under PDVSA, has engineers specialized in plastics processing, who can be invited as instructors to a seminar sponsored by a number of companies.

An effective way to train skilled workers is a certification system. In Japan, skilled workers receive official certification as part of the vocational training system. The certification system is managed by the Ministry of Welfare and Labor and certifies skills in approximately 130 fields. The primary purpose of the system is to improve the status of skilled workers within each company, upgrade production skills, and raise morale of factory workers. As for plastics processing, workers who meet specific requirements including experience can take written and practical tests and those who have passed receive a certificate from the Minister of Welfare and Labor or a provincial governor. Note that testing and certification service is entrusted to a private company. Four skills are certified in the field of plastics processing, namely compression molding, injection molding, inflation film molding, and blow molding. A worker who pass any one of the four skills is automatically certified for other three skills. Certification is classified into four classes, i.e., extraordinary class, first class, second class, and third class.

2) Capital investment

Most SMEs use old production equipment and expensive, locally made materials. Their products have been losing share to imports due to the lack of cost competitiveness, and together with the decline in the domestic market, their capacity utilization rate has dropped to 43%. As a result, production costs have been rising

further to make them difficult to stay in business. In fact, around 40 SMEs went out of business or bankrupt in the recent few years.

The situation can be improved by introducing new production equipment that would reduce labor costs, improve quality, and minimize loss. However, most SMEs do not have financial access for capital spending.

3) Labor management

Many SMEs visited by the study team pointed out problems related to employment and labor management. The government enforces a set of employment conditions that favor workers, and legal requirements for various allowances work against SMEs by increasing labor costs that represent major portions of their production costs. Similarly, the welfare system including paid holidays imposes undue burdens on SMEs.

3.2.3 Proposals for Sectoral Reform for the Venezuela Plastic Products Industry

On the basis of the results of the above analysis, the following proposals are made to upgrade the ongoing efforts to promote the plastics industry in Venezuela.

(1) Vision

The small and medium enterprises in Venezuela's plastic products industry are to work towards achieving the following by the target year of 2005.

"On the basis of government policy for promotion of the SME sector, by achieving the three objectives of expanding the market through linkages with the major plastics-using industries, of improving cost competitiveness through collaboration within subsectors, and of upgrading of technology, to contribute to the growth of the SME plastic industry within the overall context of V's plastic products manufacturing industry."

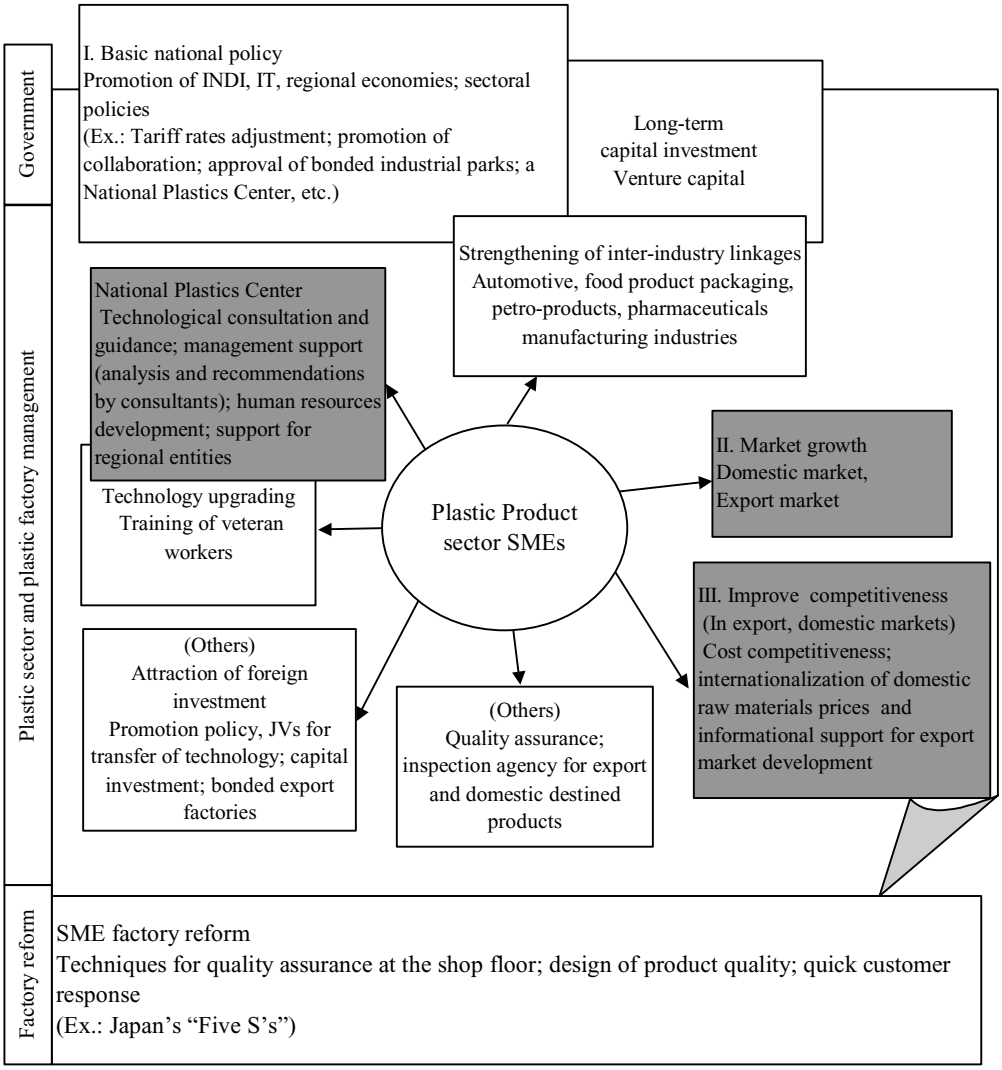
(2) Mission

The foregoing five items comprise the mission advocated for the sectoral reform program. They are to be supported through the three approaches of basic government policy, management strategy and practice at the level of companies in the sector, and through reform at the factory level.

1. Basic items for implementation of factory reforms: SME factories are to be reformed by the realization of shop-floor quality assurance programs, adoption of a re-evaluated marketing orientation in the product development process, and achieving quick customer response, in compliance with customer needs.
2. Market growth strategy: Implementation of strategies for expansion of the market and aggressive development of the export market.
3. Strategy for improving cost competitiveness: Promotion of joint purchasing of raw materials for plastic production, and by use of IT the collection and application of information to business activities.
4. Technology upgrading: Creation and support for a "National Plastics Center."
5. Attraction of foreign investment; and introduction of a standardization and quality assurance programs: promotion of the attraction of investment from other countries as a means to shift towards greater output of high value-added products and

specialty products; improving standardization and quality assurance systems as a means of expanding exports

FIGURE 3.2.5 SCHEMATIC VISUALIZATION OF BASIC POLICIES FOR SME PLASTIC Products Industry Promotion



Source: JICA Study Team

The five components are as indicated in Figure 3.2.5 (Latin numerals are keyed to the diagram). Factory reform, V, is the most fundamental means of achieving the desired improvement in the industry' components II, III, and IV represent modernization of the sector, and I represents the legislative and administrative framework to support private-sector initiatives.

(3) Strategy Proposal

1) Reform in the Petrochemical Industry

Venezuela is working towards the goal of having in place in 2004 a million tons/year of ethylene production, and 780,000 tons/year of polyethylene production. This would mean a doubling of polyester supply. Work by related parties (the government, polyethylene suppliers, the plastics products manufacturing industry and others) is progressing at eliminating potential problems in the polyethylene production chain.

The new plant may be able to attain the target production cost only if it maintains a high rate of capacity utilization. Whereas it would be necessary in order to achieve the target to sell 780,000 tons in the domestic and export markets combined, it is believed that the following objectives require support for attainment of a suitable level of sales in the domestic market:

a. Domestic prices for plastic resins must be brought close to world market prices.
b. Domestic consumption of plastic products for packaging and wrapping by domestic companies must be promoted through ASOQUIM.
c. The functions of the National Plastics Center must be improvedand in particular the training of veteran workers (supervisors) is to be done.
d. Support must be provided for improvement of technology at SMEs.

2) Market Growth, Inter-Industry Linkage, Development of Export Markets

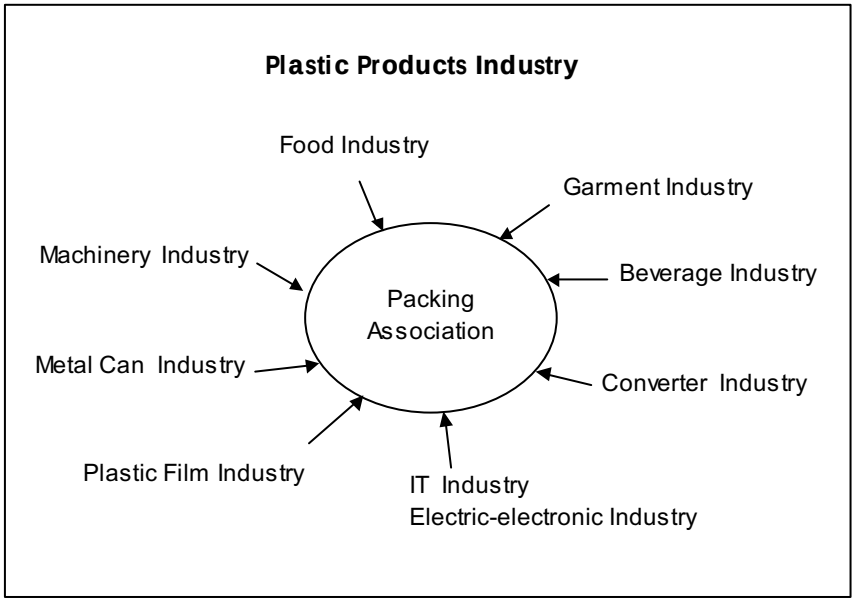
Expansion of the domestic market cannot be easily attained. This objective can be realized, however, if the relations between the different subsectors at the SME level can be improved, and if suitable efforts are made in related industries (user industries; see below) for introduction of new products and for promotion of the development of new uses for plastics (see Figure 3.2.6).

a. Plastic Products Related Industries

Food industry (candy, cookies and snack food, flour, rice....)
Garment industry (shirts, underwear, suits, shopping bags...)
Machinery industry (automobile parts, head and tail lamp covers, bumpers, mud guards....)
Metal can industry (extruded containers, publications, retort pouch foods, packaging for cans...)

Plastic film industry (0.5 to 1.0 ton shipping containers, fertilizer sacks, chemical containers....)
Beverage industry (mineral water bottles, juice containers, milk containers...)
Converter industry (sterile [multi-ply paper-plastic] containers, laminated products, shopping bags, product packaging...)
Development of new uses in agriculture (heat retaining sheets for cultivation in low-temperature areas; UV-barrier sheets; moisture-barrier sheets...)
IT and electric-electronic industries (cases, cabinets, terminals...)
Inspection (analytic instruments; reagent vessels; laboratory equipment [replacing glassware]; testing equipment...)

FIGURE 3.2.6 INTER-INDUSTRY LINKAGE



Source: JICA Study Team

In order to strengthen inter-industry linkages, it would be advisable to organize a "packaging technology association," composed of key persons working with packages and packaging in relevant industries, and on the basis of analysis of the functional requirements of packaging materials in each industrial area, to develop materials and uses for plastics for use as such materials. Functional requirements to be examined would include gas and moisture penetration rates, mechanical strength, resistance to abrasion, transparency, food safety, ability to be recycled, and the like.

b. Potential Market in the Automotive Industry

The potential demand in the automotive industry can be gauged by the estimation of the Japan Automobile Manufacturers Association that for a compact passenger car in model year 2001 8.3 kg of plastics were used, of which 50% was polypropylene and polyvinyl chloride use was 1 kg and had declined from earlier levels. Use of polypropylene is expected to increase in the future. It is recommended that in view of the expected increase (see table below) that the private sector and the government adopt initiatives whereby domestic products can have a greater market. The role of the proposed National Plastics Center would be important in this connection.

TABLE 3.2.15 ESTIMATIONS OF PLASTICS USAGE IN COMPACT PASSENGER CARS

(units : Kg)	1992	1997	2001
PE	0.3	0.4	0.4
PP	2.5	2.8	4.0
PVC	1.1	1.1	1.0
Others	3.4	3.2	2.8
Total	7.3	7.5	8.2

Source: JAMA

c. Development of Applications of Plastic Film and Sheeting for Agricultural Uses

COVEPLA has been formed with the objective of developing agricultural uses for plastic materials. There are numerous applications that have been identified for the cool-temperature parts of Venezuela, such as protection against dehydration of seedlings, shutting out UV radiation, forcing of plants, and controlling ripening of fruit during shipment and storage. It would be helpful for promotion of such developments. There is great value to this as basic technology for Latin American production of "clean" vegetables, stabilization of fruit prices, improvement of agricultural productivity, promotion of the adoption of scientific farming, and the exportation of agricultural products.

It is proposed that through the COVEPLA organization that a study be made of relevant technology is use or under development in other nations, and that the interchange of technology be initiated. It is believed that promotion of R&D through COVEPLA would be fruitful in a short time.

d. Development of the Export Market

The high-potential export markets for Venezuela are the Caribbean nations and Columbia. These countries, however, are also Venezuela's competitors. Unless inexpensive raw materials are procured from the world market, and production costs are kept low through appropriate production technology and low labor costs, the Venezuelan plastics products industry cannot easily compete against them. In comparison to these other countries, however, Venezuela possesses high quality technology and a high quality workforce, and the superiority of having domestic production of the raw materials for plastics production, as well as having a domestic market of good scale to support the industry.

In view of the above, the regions to which Venezuela has recently exported products and the products that have been exported are what should be taken up if the issue at hand is how to promote export growth in the near term, and improve the balance of payments. That is, the development of new markets and new products requires a certain amount of time, while it is rational to increase exports by recapturing lost markets.

Export regions: Within Mercosur, the northern Brazil, and the European, Caribbean, and Columbian markets are suitable targets. It would be necessary to work at the collection of information from the industrially advanced countries of Europe and the United States, and at development of export markets with the objective of maintaining competitiveness in the future. Efforts at developing the market in the advanced countries would contribute to the improvement of technology levels in Venezuela.

Export products: Export possibilities should be examined for extruded products for which there already is a track record for export business, technology related to extruded products, markets where exports have been successful, as well as a review of the products and study of quality, production cost, and output quantities. In such an instance, it would be vital to seek the cooperation of resin producers in order to be able to purchase resin at export prices.

It is proposed that a study committee be formed in order to concentrate the efforts of the SMEs in promoting exports, and that it develop an export strategy.

3) Strengthening Competitiveness

Many analysis and reports for competitiveness of the plastic product sector have been made. These are contributing to structure improvement and qualitative change of the sector. While it avoided repeating these reports, it described briefly the main two points considered very effective for the industry as follows:

a. Cost competitiveness

The material cost accounted in the price of a product is about 72% in the high case and 50% in the low case. Therefore, in order to increase cost competitiveness, in many cases, reduction of a material cost as well as improvement in yield rate and curtailment of a loss, are the most effective. In order to lower the purchase material cost, it is most effective to lower the domestic production plastic resin price. Manufacture cost can be cut 10-15% by reducing a materials price 15%. However, in order to fully enjoy the effect, it must be carrying out curtailment of a loss, and improvement in yield rate at the same time.

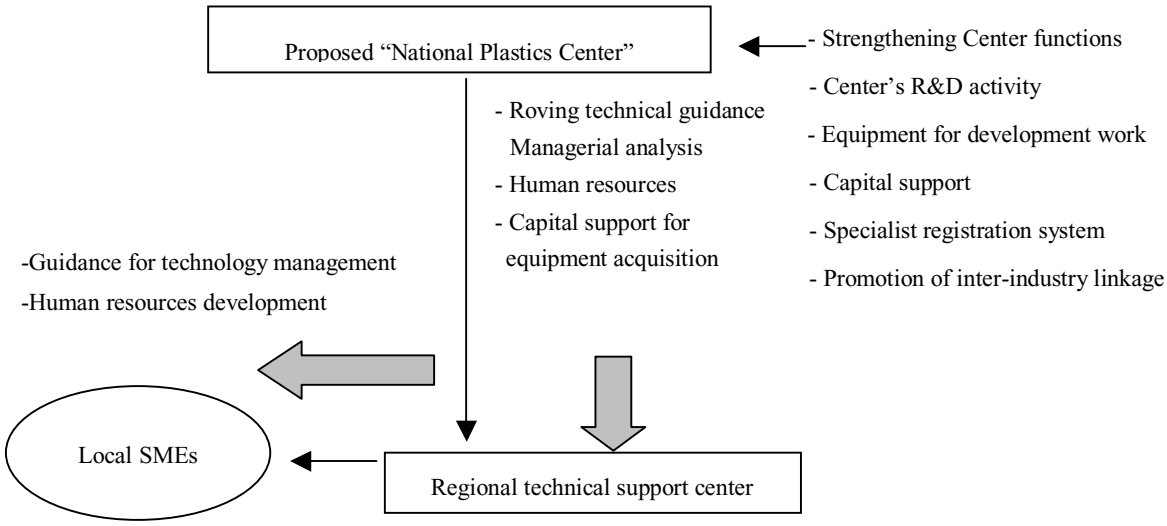
b. The common purchase of materials resin by setting up a common purchase association

The establishment of a common purchase association for SMEs was recommended in order to purchase plastic materials in lump sum in large quantities, reduce materials expense at the end. The common weakness of individual SMEs is a lack of fund for purchasing raw material, and being unable to purchase much resin materials at once. One of solutions is to create a common purchase organization by SMEs. Thus, a cooperative can gain negotiating power against resin suppliers to pull down the price by extensive purchase. Moreover, a cooperative will be able to receive a loan from a bank. Consequently, SMEs will be able to obtain required amount of materials resin from the common purchase organization which they belongs. Such a common purchase organization needs to continue continuously. For this purpose, it is desirable that the middle-scale company which purchases resin of 100 - 300ton monthly will be the core of the organization. As for a central and the local government, it is recommended to support setting up the organizations for a common purchase plan and materials supply. FONCREI may assist to supply a fund and PDVSA may cooperate in establishment and activity of organizations by selling raw materials. In addition, it is a good example that the common purchase association of an ARAGUA state is inaugurated from April, 2001.

4) National plastic center

As for the national plastic center Project of Venezuela, a detail plan is creating by the parties concerned (the government, ASOQUIM, AVIPLA, university, etc.). Since the contents of details were not indicated to the JICA Study Team, the following contents of an enterprise are proposed as reference.

Purpose: Establishing the technical center of a processing industry with the purpose of sustainable development of a plastic processing industry with competitiveness. The main functions are shown below:



For the staff, tie-up with the existing organization (examples: CEDEA, INCE, .INDESCA, CIED, INTEVEP) can be considered.

a. Technical consultation

Perform traveling technical consultation by the experts regarding production, quality, product development, etc. for SMEs. It might take one or two days to solve problems of each factory. For a long-term subject, the center should make a contract by an agreements with SMEs, to consulate one day a week within one to two months continuously. In order to strength competitiveness of the sector, the seminar for SME managers and engineers should be held. In addition, a registration system should be made for reservation of experts, and creation of specialist's Network.

b. Management diagnosis and instruction system

If economic environment and social environment change, since the talented people in SMEs are insufficient, it will become difficult to solve many problems by themselves. It responds to a request of management improvement by consulting so that a healthy enterprise may grow.

c. Cooperation with a local organization

Make a cooperation with district technical support organizations to help local SMEs which are facing management and technical problems.

In order to employ the feature of the district, selective local promotion should be planned and guided. For example, ZOLCCYT (Zona Cultural Científica y Tecnólogia) of Merida, paying attention to the locality, is carrying out promotion of the Plastic product application, development of medical treatment, IT, and an agricultural field. The Center should cooperate with such an organization, to support a local company.

d. Promotion of the linkage between industries (refer to strategy proposal)

e. Introducing official approval system of "consultant engineer"

The purpose of "consultant engineer" official approval system proposed is to complete training of a foreman class and to give them a motivation to study. It also improve a status in the company, and to upsurge work incentives (work morals). A foreman in the company, is expected to serve as the leader of the work group, and contributing to company performance improvement.

f. Technical upgrade through educational training

It also includes the educational training of the foreman for the improvement in technical aspects.

A leading worker's on-the-job training carries out with cooperation of the existing organization (INCE, ASOQUIM, CEDEA, ...). Moreover, training will be carried out using the actual production facility. Therefore, a instructor with experience in business is the optimal. Cooperation of a company will be necessary if possible. Establishment of a plastic center is expected to start with participation of private enterprises as a member for this purpose.

Training, Seminar for management, administration and R&D

The main activities of the center will be these trainings and seminars. These are expected to be as profit making business of the center.

Management technical business education

Production, quality, and sales management on-the-job training are performed in consideration of the culture and the national traits of Venezuela.

Company administrator (technology and management) training

As R & D activities in cooperation with a university and the various existing research organizations, themes, such as development support of high added value, differentiation, a special article, and a highly efficient article, and spread and promotion of new technology, can be considered.

The management activity expense of a plastic center

The finances of the many similar organization are insufficient, facing difficulties. In Japan, there are many examples currently managed as a center with a membership system where a private enterprise takes the lead. In the case of the large-sized theme as national activity, the government pays funds and is managing research organization directly. An important thing is how to obtain the management fund which maintains this center. Permanent management is difficult only with the charge of technical instruction, and technical development. For this reason, it is desirable to develop continuous government support and membership fees as a financial base.

5) The improvement proposal for individual company (SMEs factory spot improvement)

Technical aspect(on-site quality control, product quality design, production control: market-in)

Quality control on the machine side: A peculiar quality control method is required for every company. Although the theory and the technique as the foundations of a quality control are common to the world, the method and timing should be suitable for each company, otherwise they are ineffective.

In the case of Venezuela, it recommends developing the quality control on the machine side, where the operator of a plastic processing machine makes prompt decision. Judging from the present labor situation and an educational level, it can be realized by on-the-job training. For this purpose, it is required to have the leading worker (foreman class employee) of a factory understand the technique and tool of a basics of quality control, and learn application capability. This person will be a Key-

man who guides other employees on the field. This Key-man solves small quality problems and curtailment of loss at the end. A quality control section concentrates on creation and amendment of standards and review of an QC situation.

Product quality design: The basic contents of market-in is already obsolete. However, it is still effective for company survival. The KEYWORD is product quality design. This is the best way for SMEs of the Venezuela plastic product sector to regain vitality. The foundations of a product quality design is to produce a thing needed by a customer and to sell at a proper price. There are many examples in Japan which the new product designed by a factory employee revived the large company. It is usually overlooks the point that an employee is a part of a market. In the most cases there are misunderstanding that only the president and the upper management of sale know the market. Since a factory employee's voice is also one of the market information, the system for collecting these voices should be formed. Selling information, market-in, quick action to production, are Keywords.

One proposal to assist above items is factory visit and traveling consultation by the engineer with abundant experiences.

There are many things which can be the effective by immediate judgment and prompt decisions, such as improvement in quality on the machine side, curtailment of a loss, exclusion of waste and overwork in production of SMEs. In order to foster personnel who can make these judgment and decisions, it is important to give on-the-job-training and technical brush up for a leading employee and a foreman by traveling consultation. However, it is necessary to provide financial assistance at the same time.

6) Others

a. Renewal of obsolete facilities in SMEs

There are many SMEs using the old production facility, and continuing production using expensive domestic plastic materials. As a result, productivity is low and the amount of money of the loss is large.

One of this solution is common production and common investment. A plastic sector companies can establish a cooperative society and performs scrapping of production facilities and introducing new equipment. The method has been enforced in a Japanese textile industry and plastic industry in the past. This method helps companies discarding surplus equipment and having cost competitiveness by raising operating efficiency. However, the government, SMEs, a financial institution, a

plastic materials producer, a plastic processing industry association (AVIPLA), etc. need to cooperate to tackle this.

b. Joint technology introduction by SMEs

Production and development of high added value, special article, and differentiation goods etc. are means to activate SMEs in Venezuela,. However, for the present SMEs situation, it is not easy to develop a new product by themselves. A shortcut is introduction of technological know-how. In this case, the linkage between same or different industries is important. SMEs might cooperate to unite the each advantage, and form the organization for receiving technological know-how or of foreign direct investment.

An examples:

Special cap of a container (high-density PE)

Disposable injector body without metal needle (cooperation with special steel maker)

High-pressure injector (special plastic)

Plastic gear which does (high-density PE, special plastic use ..ex.. clock, printer, measurement apparatus)

3.3 Aluminum Product Industry

3.3.1 Current state of the world aluminum industry and major trends

(1) Major trend (demand, market, production and supply, capital investment, etc.)

1) Aluminum ingot (primary aluminum) production, demand, investment

Table 3.3.1 shows worldwide aluminum ingot (primary aluminum) production and demand, investment trends in the recent years. Production, except for declines in 1992 and 1994, showed steady growth with consumption during the twelve-year period, with the average annual growth rate of 1.6%.

TABLE 3.3.1 WORLD PRIMARY INGOT PRODUCTION AND CONSUMPTION (1987 – 1998)

(1000 tons)

Year	Production	Increase/decrease over previous year	Consumption
1987	17501.9		18137.5
1988	18583.6	6.2%	18877.9
1989	19156.0	3.0	19280.1
1990	19379.0	1.2	19275.4
1991	19690.2	1.6	18780.3
1992	19497.5	-1.0	18530.7
1993	19798.5	1.5	18128.9
1994	19157.8	-3.2	19691.5
1995	19685.5	2.7	20464.9
1996	20852.9	5.9	20654.5
1997	21804.6	4.6	21774.7
1998	22718.2	4.2	21959.0

Source：Metal Statistics 1988～1998

Table 3.3.2 lists countries which report significant growth of bauxite mining, alumina production, and aluminum smelting capacities after 1995.

TABLE 3.3.2 COUNTRIES WITH GROWING ALUMINUM INGOT PRODUCTION CAPACITY

Category	Country
Bauxite mining	Brazil, Jamaica, Venzuela (3 million tons in 1995; 8 million tons in 1996), India
Alumina production	Greece, Australia, Brazil, Jamaica, Venezuela (8,466,000 tons in 1994; 8,966,000 tons in 1995; 9,966,000 tons in 1996; and 12,416,000 tons in 1999), Guinea, PRC, India
Aluminum smelting	Iceland, Norway, Italy, Russia, Slovakia, Australia, New Zealand, South Africa, Brazil, Chile, Venezula (640,000 tons in 1994; 855,000 tons in 1996; and 881,000 tons in 1999), Egypt, Azerbaijan, Bahrain, PRC, India, Iran, Qatar, Saudi Arabia, Turkey, and U.A.E.

Source：IBA secretariat, US Bureau of Mines, trade journals

2) Aluminum ingot price trends (LME statistics)

Figure3.3.1 shows aluminum ingot price trends at LME (London Metal Exchange) in the past three years. During the period, the price ranged between US$1,140/ton and US$1,750/ton. LME was established in 1877 and trades seven metals (aluminum, copper, zinc, secondary aluminum, tin, lead and nickel). It daily quotes prices up to 15-27 months in the future. Aluminum has been traded since 1978 and prices for 99.7% ingot are quoted since 1987. LME fulfills the following four functions: 1) hedging against a risk of ingot price fluctuation; 2) setting reference prices for world trade; 3) financing through cash deals and depositing with LME warehouse; and 4) speculation using price fluctuation. The highest price of 99.7% ingot since price quotation was started was US$3,584/ton (1988) and the lowest price US$1,000/ton (1993).

FIGURE 3.3.1 ALUMINUM INGOT PRICE TRENDS AT LME

Source : LME

3) Current state of production of aluminum products, demand, capital investment, and major trends

Table 3.3.3 shows yearly changes in casting production in the top 12 countries and production of rolled products in the top 15 countries. Casting production grew steadily, the average growth rate of 5.3%. On the other hand, production of rolled

products peaked out in 1994 and recorded negative growth of an annual 1.2% after 1995.

TABLE 3.3.3 PRODUCTION TRENDS IN CASTING (TOP 12 COUNTRIES) AND ROLLED PRODUCT (TOP 15 COUNTRIES)

(1000 tons)

Year	Casting production	Increase/decrease over previous year	Rolled products	Increase/decrease over previous year
1987	2996.9		11498.0	
1988	2970.4	-0.9%	11983.6	4.2%
1989	3543.9	19.3	12198.1	1.8
1990	3384.5	-4.5	12597.1	3.3
1991	3341.1	-1.3	12638.5	0.3
1992	3608.2	8.0	12766.6	1.0
1993	3712.8	2.9	12812.2	0.4
1994	4086.5	10.1	14574.5	13.8
1995	4393.3	7.5	14444.1	-0.9
1996	4499.2	2.4	14365.3	-0.5
1997	4928.5	9.5	15414.2	0.7
1998	5183.1	5.1	14759.7	-4.2

Source：OEA Annual Report (1998～1999)、World Metal Statistics (March 1999)

Table 3.3.4 summarizes major announcements on construction, capacity expansion and modernization of major aluminum mills in the world.

TABLE 3.3.4 CAPACITY EXPANSION PLANS OF MAJOR ALUMINUM MILLS IN THE WORLD

Country	Company	Mill name	Type of investment
Canada	Alcan Rolled Products	Kingstone	Capacity expansion for automotive parts
U.S.	Alcoa	Davenport	Increase in production of heavy plate for aircraft fabrication
	Alumax		Acquired by Alcoa
	Alcan Rolled Products	Fairmont	Facility modernization
		Oswego	Modernization of hot mill
		Terre Haute	Production increase of thin plate
	Logan Aluminum Mill	Logan	Production increase of can materials
	Reynolds	McCook	Production of heavy plate for aircraft fabrication
	Conalco	Hannibal	Capacity expansion
Germany	VAW	Grevenbroich	Capacity expansion, modernization
	Hoogovens Aluminium	Koblenz	Capacity expansion
France	Cengedur Pechiney	Issoire	Capacity expansion
		Neuf-Brisach	Capacity expansion
U.K.	British Alcan		Capacity expansion for aluminum foil production
Italy	Aluminia	SAVA Fusina	Capacity expansion
Brazil	Alcan		Production increase of can materials
U.A.E.	Profile RHFLLC		New mill
	ALGALIA		New mill construction
Bahrain	Guef Aluminium Rolling Mill Co.		Major capacity expansion
South Korea	ATA		Capacity doubling
Taiwan	CS ALUMINIO		Capacity doubling, production of aircraft materials
	New Sun Metals	Kaohsiung	New mill
PRC	Sur-Oeste Aluminio	Chungking	Expansion plan participated by Pechiney
Indonesia	ALUMINDO	Surabaya	Capacity expansion
India	Naruni	Orissa	50,000 ton capacity building
	Baruni	Korba	Rolling mill project under technical assistance of Russia
Malaysia	Aluminio Industria		Capacity expansion
South Africa	Huret Alminio		Capacity doubling

Source : Japan Aluminum Industry Association

4) Aluminum demand and trade by category and trade (major exporting and importing countries)

Table 3.3.5 shows classificaion of aluminum products in selected countries in 1998, together with production volume and share. Note that these data are synthesized from various sources and are not entirely accurate. Table 3.3.6 shows exports and imports of rolled aluminum products by country in 1998. North America dominates both exports and imports. Table 3.3.7 lists top ten countries in exports to North America, together with exports, imports and their shares. Venezuela is the large

exporter in Latin America, with 3.4% share. As for imports, the country ranks third (2.7%) next to Mexico and Brazil.

TABLE 3.3.5 PRODUCTION OF ALUMINUM PRODUCTS IN MAJOR PRODUCING COUNTRIES, BY CATEGORY (1998)

(1000 tons)

Product category	Production	Percentage share
Rolled products	14908.0	69%
Castings	5183.1	24%
Cables	709.4	3%
Others	910.5	4%
Total***	21711.0	

Source: *1. OEA Annual Report (1998 – 1999); *2 OEA Annual Report (1998 – 1999); data published by Japan Aluminum Industry Association; Japan Aluminum Industry Association, Rolled Aluminum Product Pocket Book (2001) p.39; *3 World Metal Statistics (March 1999); *4 Net amount

TABLE 3.3.6 EXPORTS AND IMPORTS OF ROLLED PRODUCTS BY COUNTRY (1998)

(1000 tons)

Country	Exports	Imports
U.S.[*1]	1008.4	674.9
South Korea[*2]	153.1	88.7
Taiwan[*2]	55.6	77.1
PRC[*2]	107.5	339.8
Hong Kong[*2]	98.4	108.5
Thailand[*3]	8.2	66.4
Singapore[*3]	22.9	95.9
Malaysia[*4]	29.6	105.1
Indonesia[*3]	23.3	52.4
Philippines[*3]	3.3	31.8
Japan[*5]	325.3	63.9

Source: [*1]: U.S. Department of Commerce, Bureau of the Census, International Trade Administration) [*2]: Japan Aluminum Industry Association, [*3]: 1997 figures, [*4]: Figures in 1996 and 1997, [*5]: Customs Clearance Statistics, Ministry of Finance of Japan

TABLE 3.3.7 TOP TEN COUNTIRES IN ALUMINUM PRODUCT EXPORTS TO AND IMPORTS FROM THE U.S. (1998)

(1000 tons)

Country	Import		Export	
	Import volume	Share	Import volume	Share
Canada	474.2	59.9%	453.6	45.9%
Germany	70.6	8.9		
Venezuela	29.2	3.4	26.8	2.7
Japan	27.4	3.4	22.1	2.2
U.K.	21.8	2.8	16.0	1.6
Russia	16.0	2.0		
France	15.3	1.9		
Bahrain	14.2	1.8		
South Korea	12.1	1.5	22.3	2.3
Greece	12.0	1.5		
Mexico			183.2	18.5
Brazil			78.8	8.0
PRC			28.8	2.9
Hong Kong			17.0	1.7
Taiwan			14.7	1.5

Source：U.S. Customs Clearance Statistics （U.S. Department of Commerce, Bureau of the Census）

(2) Regional trends

1) Major aluminum ingot producing and importing countries (areas)

Table 3.3.8 lists top ten countries in aluminum ingot production and imports, with production in 1998 and imports in 1999. Again, North America ranked first in both exports and imports. Venezulela ranked tenth in productiona and holds a 2.6% share.

TABLE 3.3.8 TOP TEN ALUMINUM INGOT PRODUCING AND IMPORTING COUNTRIES

（1000 tons）

Country	Production in 1998		Country	Imports in 1999**	
	Production volume	Share		Import volume	Share
U.S.	3,712.7	16.3%	U.S.	2,835.9	21.4%
Russia	3,004.7	13.2	Japan	2,657.4	20.0
PRC	2,435.3	10.7	Korea	880.4	6.6
Canada	2,374.1	10.5	Taiwan	558.5	4.2
Australia	1,626.2	7.2	Italy	535.7	4.0
Brazil	1,208.0	5.3	PRC	534.0	4.0
Norway	995.5	4.4	U.K.	444.0	3.3
South Africa	692.5	3.0	Netherlands	435.0	3.3
Germany	612.4	2.7	Belgium	413.2	3.1
Venezuela	584.3	2.6	France	398.4	3.0

Source：*Metal Statistics(1988～1998) **WBMS(World Metal Statistics)

2) Major producing and importing countries (areas) of aluminum ingot

Table 3.3.9 shows production of aluminum products (primary and secondary) in top fifteen countries by casting and rolled product. North America hods predominat share. Venezuela is not included in the list because it is based on statistics of European countries, but she ranks below Switzerlands.

TABLE 3.3.9 PRODUCTION OF ALUMINUM CASTING AND ROLLED PRODUCTS IN TOP FIFTEEN COUNTRIES IN 1998

(1000 tons)

Country	Casting		Rolled products	
	Production volume	Share	Production	Share
U.S.	2231.9	43.0%	7699.7[*1]	46.3%
Japan	1067.2	20.6	2324.5	14.0
Germany	607.5	11.7	1823.7	11.0
Italy	598.5	11.5	842.7	5.1
France	272.6	5.3	749.6	4.5
U.K.	147.3	2.8	507.7[*2]	3.1
Spain	107.6	2.1	285.6[*3]	1.7
Australia	78.2	1.5	192.7	1.2
Sweden	34.0	0.7	140.4	0.8
Switzerlands	17.5	0.3	176.6	1.1
Netherlands	15.0	0.3	156.9[*4]	0.9
Finland	5.8	0.1	33.1	0.2
Belgium			197.1	1.2
Scandinavia			459.5	2.8
Norway			268.4	1.6
World total	5191.4		16640.2	

Source: OEA Annual Report (1998 – 1999); *1 U.S. DOC Bureau of Statistics; *2 OEA Annual Report (1998 – 1999), 1997 data; *3 OEA Annual Report (1998 – 1999), 1990 data; *4 OEA Annual Report (1998 – 1999), 1992 data; *5 World Metal Statistics (March 1999)

(3) Production, consumption, exports and imports in neighboring countries

1) Aluminum alloy

a. Brazil

Brazil is the largest producer and consumer of aluminum ingot in Latin America. Its production is twice that in Venezuela. Table 3.3.10 shows yearly changes in ingot production, consumption, exports and imports between 1987 and 1999. Growth of production slowed down between 1991 and 1998. The annual average

growth rate during the twelve year period is 3.5%. The domestic consumption rate ranges between 31% and 51%, with no significant trends being observed.

TABLE 3.3.10 PRODUCTION, CONSUMPTION, EXPORTS AND IMPORTS OF ALUMINUM INGOT IN BRAZIL (1987 – 1999)

(1000 tons)

Year	Production	Increase/decrease over previous year	Consumption	Consumption rate	Export	Import*
1987	843.5		430.3	51.0%		
1988	873.5	3.6%	324.2	37.1	514.9	0.1
1989	887.9	1.6	420.1	47.3	472.1	2.5
1990	930.6	4.8	341.2	36.7	527.8	2.6
1991	1139.6	22.4	354.2	31.1	787.6	2.2
1992	1193.3	4.7	377.1	31.6	817.5	1.3
1993	1172.0	-1.8	378.9	32.3	799.6	6.5
1994	1184.6	1.1	414.1	35.0	777.8	7.3
1995	1188.1	0.3	500.6	42.1	703.0	15.6
1996	1197.4	0.8	497.0	41.5	709.0	8.6
1997	1189.1	-0.7	478.6	40.2	716.2	5.7
1998	1208.0	1.6	521.4	43.2	692.4	5.8
1999					788.6	2.1

Source：Metal Statistics (1988～1998) *WBMS(World Metal Statistics)

b. Mexico

Table 3.3.11 shows production, consumption, exports and imports of aluminum ingot in Mexico. The annual average production during the nine-year period is 60,000 tons, with no growth trend being observed. The domestic consumption rate is 1.56 and imports are required each year to make up for a deficit.

TABLE 3.3.11 PRODUCTION, CONSUMPTION, EXPORTS AND IMPORTS OF ALUMINUM INGOT IN MEXICO (1987 – 1999)

(1000 tons)

Year	Production	Consumption	Consumption rate	Exports	Imports*
1987	62.2	68.1	109%		
1988	68.3	65.9	96	13.3	9.2
1989	71.7	79.8	112	0.9	11.8
1990	67.5	91.9	136	1.5	20.5
1991	66.9	94.4	141	0.2	44.2
1992		83.4		0.5	76.6
1993		97.1		0.7	99.0
1994		80.8		0.3	59.3
1995	10.4	39.8	382	1.1	31.4
1996	61.5	93.3	151	2.8	34.2
1997	66.4	83.4	126	0.4	16.6
1998	61.8	91.9	148	0.8	30.9
1999					

Source：Metal Statistics (1988～1998) *WBMS(World Metal Statistics)

c. Colombia

Table 3.3.12 shows production, consumption, exports and imports of aluminum ingot in Colombia. Consumption grew steadily over the twelve-year period.

TABLE 3.3.12 PRODUCTION, CONSUMPTION, EXPORTS AND IMPORTS OF ALUMINUM INGOT IN COLOMBIA (1987 – 1999)

(1000 tons)

Year	Consumption	Increase/ decrease over previous year	Exports*	Imports
1987	17.9			
1988	8.7	-9.2%		
1989	13.8	5.1		
1990	15.6	1.8		
1991	23.8	8.2		
1993	28.8	0		
1994	35.3	6.5		
1995	33.3	-2.0		
1996	35.0	1.7		
1997	43.3	8.3		
1998	40.0	-3.3	0.01**	0.11**

Source： Metal Statistics (1988～1998) *WBMS(World Metal Statistics), **Exports to and imports from the U.S. are based on customs clearance statistics in the U.S. (Bureau of Statistics, DOC)

d. Argentina

Production of aluminum ingot in Argentina grew steadily over the twelve-year period, with the annual average growth rate of 1.6%. The domestic consumption rate remained more or less unchanged, with the annual average of 61.2%. (Table 3.3.13)

TABLE 3.3.13 PRODUCTION, CONSUMPTION, EXPORTS AND IMPORTS OF ALUMINUM IN ARGENTINA (1987 – 1999)

(1000 tons)

Year	Production	Increase/decrease over previous year	Consumption	Consumption rate	Exports*	Imports*
1987	155.1		142.0	91.5%		
1988	154.7	-0.3%	142.8	92.3	10.9	
1989	164.2	5.8	97.0	59.0	80.6	
1990	165.6	0.8	67.9	41.0	129.4	
1991	169.0	2.0	103.5	61.2	111.0	
1992	155.6	-8.6	108.3	69.6	48.1	
1993	172.9	10.0	94.5	54.7	73.1	0.8
1994	175.0	1.2	105.8	60.5	61.0	0.7
1995	185.5	5.7	84.0	45.3	95.2	1.3
1996	183.9	-0.9	86.4	47.0	93.3	1.2
1997	183.7	-0.1	95.3	51.8	113.5	1.3
1998	186.7	1.6	113.0	60.5	82.0	
1999					109.8	

Source：Metal Statistics (1988～1998) *WBMS(World Metal Statistics)

2) Aluminum products

a. Brazil

As shown in 3.3.14, production of rolled products in Brazil grew firmly, with the annual average growth rate of 10.9% in the recent six years. Casting production remained more or less constant during the same period, with the annual average of 113,900 tons. Compared to exports and imports, domestic consumption absorbs major portions of production in Brazil.

TABLE 3.3.14 PRODUCTION OF ROLLED PRODUCTS AND CASTINGS IN BRAZIL AND EXPORTS TO AND IMPORTS FROM THE U.S.

(1000 tons)

Year	Production		Rolled products	
	Rolled products	Casting	Exports to U.S.*	Imports from U.S.*
1987	341.6	88.1	7.1	1.1
1988	312.1	102.1	16.7	2.1
1989	344.9	102.0	10.1	3.4
1990	255.8	86.5	9.1	7.0
1991	272.7	80.8	2.4	5.5
1992	257.8	85.1	4.5	6.5
1993	334.6	104.7	6.4	9.1
1994	401.7	117.3	12.8	15.3
1995	406.0	112.2	4.1	26.8
1996	455.6	114.1	3.4	24.1
1997	485.1	119.6	2.8	86.0
1998	525.2	115.2	1.2	78.8

Source：Metal Statistics (1988～1998) * Customs clearance statistics in the U.S. (Bureau of Statistics, DOC)

b. Other neighboring countries

Table 3.3.15 shows year changes in exports of rolled products from Mexico, the Andes Group countries, Argentina, and Central American countries. No significant change occurs, except for increase in exports from Mexico in the recent four years.

TABLE 3.3.15 EXPORTS OF ROLLED PRODUCTS FROM MEXICO, ANDES GROUP, ARGENTINA, AND CENTRAL AMERICA TO THE U.S.

(1000 tons)

Year	Mexico	Andes Group	Argentina	Central America
1987	4.0		4.6	0.05
1988	6.0		10.2	0.02
1989	5.8		7.1	1.9
1990	4.1		3.0	3.3
1991	3.0		0.7	2.2
1992	3.8		0.4	1.2
1993	2.3			0.9
1994	3.3		0.3	0.5
1995	12.2		0.3	1.0
1996	12.6	0.05	1.3	1.6
1997	20.5	0.11	1.9	3.6
1998	11.9	0.52	0.9	2.6

Source：Customs clearance statistics in the U.S. (Bureau of Statistics, DOC)

Table 3.3.16 shows yearly changes in imports of rolled products from the U.S. to Mexico, the Andes Group countries, Carribean countries, Argentina, and Central American countries between 1987 and 1998. Mexico shows healthy growth of imports.

TABLE 3.3.16 IMPORTS OF ROLLED PRODUCTS FROM THE U.S. TO MEXICO, ANDES GROUP, CARRIBEAN COUNTRIES, ARGENTINA, AND CENTRAL AMERICA

(1000 tons)

Year	Mexico	Andes Group	Carribena	Argentina	Central America
1987	29.2	1.1	1.2		0.4
1988	35.0	2.1	1.2		1.1
1989	46.3	1.5	3.8		1.3
1990	50.4	1.7	2.3		2.2
1991	67.5	1.3	2.0		2.4
1992	96.0	1.9	0.9		2.1
1993	99.4	3.5	0.8		4.9
1994	131.2	3.6			4.0
1995	130.0	3.7			3.1
1996	132.1	5.1	2.5	17.8	4.1
1997	146.8	5.3	3.3	17.9	5.6
1998	183.2	6.7	2.7	9.0	5.4

Source：Customs clearance statistics in the U.S. (Bureau of Statistics, DOC)

3.3.2 Current state of the primary aluminum industry in Venezuela and major issues

(1) Demand structure of primary aluminum

1) Domestic demand

Table 3.3.17 shows the changes in primary aluminum consumption and production in Venezuela between 1987 and 1999. Consumption varied greatly from year to year, with the annual average growth rate of around 1.0%. On the other hand, production has been on the general increase, with the annual average growth rate of 2.3%.

TABLE 3.3.17 CONSUMPTION, EXPORTS AND PRODUCTION OF PRIMARY ALUMINUM IN VENEZUELA (1987 – 1999)

(1000 tons)

Year	Consumption	Increase/decr ease over previous year	Exports	Increase/decr ease over previous year	Production	Increase/decr ease over previous year
1987	145.3				439.6	
1988	130.9	-11.0%	287.9		443.4	0.9%
1989	142.3	8.0	380.1	- 2.1%	546.0	18.8
1990	196.8	27.7	389.6	2.4	590.4	7.5
1991	170.3	-15.6	445.5	12.5	600.5	1.7
1992	150.0	-13.5	447.2	0.4	606.8	1.0
1993	155.2	3.4	415.4	- 7.7	567.7	- 6.9
1994	152.1	- 2.0	462.0	10.1	585.4	3.0
1995	183.0	16.9	382.1	-20.9	626.6	6.6
1996	206.9	11.6	439.8	13.1	634.8	1.3
1997	193.4	- 7.0	414.5	- 6.1	640.8	0.9
1998	179.7	- 7.8	410.3	- 1.0	584.3	- 9.7
1999			445.8	8.0		

Source：Metal Statistics(1988～1998) *WBMS(World Metal Statistics)

2) Export market

Table 3.3.17 shows exports trends from Venezula between1987 and 1999. Exports record negative growth in five out of eleven years, with the annual average growth rate of 0.8% during the entire period. Exports as percentage of domestic production remained relatively stable, ranging between 200% and 300%. Table 3.3.18 lists major destinations of primary aluminum exports from the country, together with percentage compositin. Top three countries are the U.S. (the worlld largest consumer), Japan (making investment in Venezuela), and Mexico (explosive growth of consumption).

TABLE 3.3.18 MAJOR DESTINATIONS OF PRIMARY ALUMINUM EXPORTS FROM VENEZUELA IN 1999

Country	Share (%)
U.S.	38
Japan	33
Mexico	11
Colombia	5
Canada	4
Netherlands	3
U.K.	2
Costarica	2
Others	2

Source：AVIAL Transforma Dec.2000, p.24

(2) Current state of the primary aluminum industry and major issues

1) Current state

In Venezuela, production and marketing of primary aluminum ingot is exclusively carried out by publicly-managed enterprise. Production facilities are concentrated in the eastern part of the country, Puerto Ordaz, Bolivar, where BAUXILUM (bauxite mining and alumina production), CARBONORCA (production of carbon electrode), ALCASA (electrolysis of alumina, rolling, and billet production), and VENALUM (electrolysis of alumina and billet production) are located in adjacent sites. These sites are also located close to Orinoco River for transportation purposes). ALCASA's facility is primarily designed for domestic products, while VENALUM for exports. Products by these manufacturing enterprises are marketed by CAVSA Corporacion Aluminios de Venezuela. The manufacturing enterprises and CAVSA are under control of CVG (Corporacion Venezolana de Guayana). Table 3.3.19 summarizes general profiles of the five companies under CVG.

TABLE 3.3.19 GENERAL PROFILES OF FIVE ALUMINUM COMPANIES UNDER CVG

Company	General profiles
CVG BAUXILUM	• Bauxite mining: Estimated reserves in Pijiguaos are 5 billion tons, and proven reserves 200 million tons, which are equivalent to 30 years of production under the present capacity. • Alumina production: Installed capacity – 6 million tons/year; actual production – 2 million tons/year • Shareholders：CVG 99%、Alussuisse Lousa Holding Association1%
CVG CARBONORCA	• Non-baking carbon electrode – 140,000 tons/year; baking carbon electrode – 195,000 tons/year • Established and commercial production started in 1987 • Shareholders：BAUXILUM 56%、VENALUM 43%、CVG 1%
CVG ALCASA	• Primary aluminum production: Capacity 210,000 tons/year, actual production 160,000 tons/year • Products：22/454kg ingots, billets, plates, rolled products (sheet production capacity of 37,000 tons/year) • Established in 1960 and production started in 1967 • Electrolytic bath – 4 lines
CVG VENALUM	• Primary aluminum production: Capacity 430,000 tons/year (largest in Latin America) • Products:：22/545/680kg ingts, 10kg alloy ingots, billets, molten aluminum • VENALUM developed the V-350 electrolytic bath, which can be operated at high current of 320～350kA, the highest level in the world to surpass PesinayPechiney AP50. For the installation of V-350, VENALUM provides opportunity for joint venture. The government also provides incentives in the areas of land acquisition, taxation and supply of raw materials.
CVG CAVSA*	• As of June 2000, executive vice president of VENALUM in charge of public relations is responsible for CAVSA's public relations, executive vice president of VENALUM in charge of marketing CAVSA's marketing, and executive vice president of VENALUM in charge of R&D CAVSA's R&D.

Source：P.L.Orsetti Rossi (VENALUM) : Presentation material for EXPO 2000 Hannover Agosto 2000
* CAVSA's brochure

2) Major issues

With the decline in international aluminum prices since 1995, deterioration of production facilities and equipment, and repeated labor strikes, profits have dropped to 50%. Furthermore, the capacity utilization rate declined sharply in the past five years and the average percentage of idling capacity reaches 40%. Overall, the aluminum sector shows no growth. CVG has announced a plan to revitalize its aluminum companies and will soon resume operation of the idling production lines. Also, it plans to transform its production chain in an attempt to change the current production structure, under while the bulk of aluminum materials is exported and aluminum products are imported. To achieve the goal, however, it is imperative to attract foreign direct investment and technology transfer.

In August, CVG ALCASA completed test runs on its Line I, which is now ready for commercial operation. The company is now waiting for an approval of the Ministry of Environment. It has 5 prototype electrolytic cells and will repair the existing ones to operate 140 cells for Line I, which will then produce 25,000 tons per year. Then, Line II will resume operation next year.

According to VENALUM, ongoing plans for expansion of aluminum production facilities are summarized as follows.

TABLE 3.3.20 ALUMINUM INDUSTRY PROJECTS IN VENEZUELA

Amount of investment	US$6,656 million
New construction and capacity expansion	ALCASA line Ⅴ additional 200,000 tons/year ALCASA line Ⅰ - Ⅱ additional 50,000 tons/year New smelting plant additional 116,000 tons/year New alumina mill additional 2.5million tons New bauxite plant additional 500,000 tons/year
Product schedule	Primary aluminum 1.6 million tons (76%) Rolled products 100,000 tons (5%) Primary aluminum alloy 100,000 tons (5%) Extrusion billets 250,000 tons (12%) Extrusion materials 50,000 tons (2%)
Investment schedule	2001～2011 New smelting plant 2003～2011
Return on investment	Recovered by 2012 ROI in 2015 is 1.34.
Production increase of high value added products	To reinforce CAVSA's semi-fnished product division and domestic transformers. In particular, the extrusion transforming industry shows high potential.

	Current (tons)	Future (tons)
Rolled products	23000	100000
Billets	101200	250000
Alloy ingot	8000	100000
Extruded product1	16000	50000
Extruded product2	0	10000

Demand forecast	In the next fifteen years, primary aluminum demand will grow at an annual 2.6%.

Source：P.L.Orsetti Rossi(VENALUM): Presentation material for EXPO 2000 Hannover, Agosto 2000, "Potencial De Venezuela Para El Desarrollo De La Industria Del Aluminio"

Thus, for primary aluminum production, short- and long-term plans seem to be established and executed effectively. However, some question the size of the long-term plan, which is three times that current level. Overall, the major challenge for the long-term plan is to implement capacity expansion projects in consistent with CVG's policy, "to shift from the current trade structure (export ingot and import finished products) and utilize local process capability."

Meanwhile, local users demand the additional provision of supply stations, free delivery to their factories, optimization of lot size, and the establishment of preferential pricing. Historically, the primary aluminum industry has not paid attention to the development of aluminum transformers that constitute an important domestic market. Recently, however, it has started to make committed efforts to develop the product chain. The next step to be taken are the establishment of an efficient physical distribution system and the price adjustment mechanism that has partially been introduced.

3) Tariff policy

The country imported 700 tons of aluminum ingot in 1998, 500 tons in 1999 and 700 tons in 2000. They were imported from the U.S. by Envaces Envalic, the largest beverage can maker in the country. The company explains that imports are necessary to ensure product quality. The import tariff on aluminum ingot is 10%.

4) Privatlization

Althugh privatization of alumina manufacturers has been repeatedly announced, they are still publicly managed. In fact, several attempts have unsuccessfully made to privatize aluminimu companies owned by CAVSA, and they have been merged into a large conglomerate, CAVSA. Dominance of publicly managed enterprises is considered to be a negative factor for the revival of the aluminum sector as a major industry for the country.

3.3.3 Current state of the aluminum transforming industry and major issues

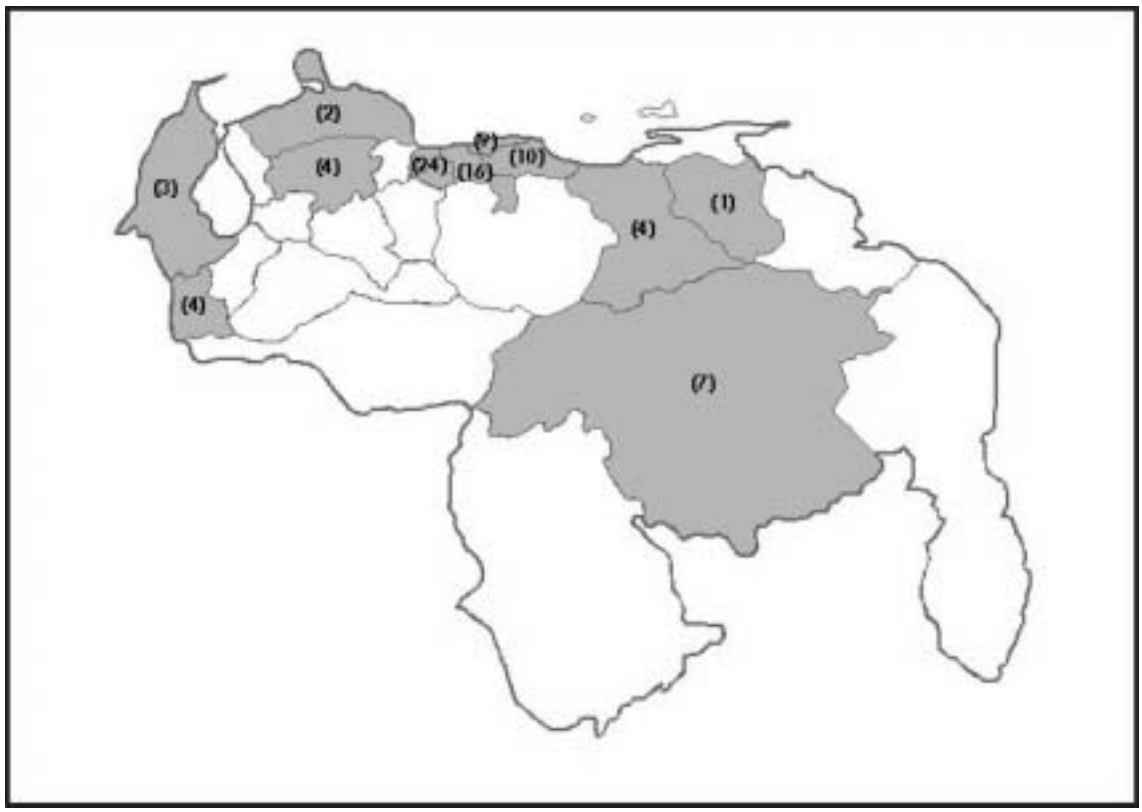
(1) Current state of aluminum transformersGeographical distribution and size of operation

The number of aluminum transformers in each state is shown below. Figure 3.3.2 plots the figures on the country's map.

DF：	9	Miranda：	10	Aragua：	16
Ccarabobo：	24	Laara：	4	Falcon：	2
Zulia：	3	Tachira：	4	Monagas：	1
Anzoategui：	4	Bolivar：	7		

Primary aluminum manufacturers are concentrated in Puerto Ordas, north of Bolivar. On the other hand, many aluminum transformers are located in four states surrounding DC.

FIGURE 3.3.2 GEOGRAPHICAL DISTRIBUTION OF ALUMINUM TRANSFORMERS IN VENEZUELA



Source： AVIAL、POTENCIAL EXPORTADOR SECTOR TRANSFORMADOR DE ALUMINIO 2001-2003, Junio 2001,

The following table shows breakdown of aluminum transformers according to application, together with the number of enterprises and employment.

TABLE 3.3.21 NUMBER OF ALUMINUM TRANSFORMERS AND EMPLOYMENT BY APPLICATION

Application	No. of enterprises	Employment
Construction material	25	1510
Electricity	4	755
Packaging	22	2420
Transportation equipment	12	980
Refrigerator	16	907
Consumer good	19	924
Total	98	7496

Source: AVIAL、POTENCIAL EXPORTADOR SECTOR TRANSFORMADOR DE ALUMINIO 2001-2003, Junio 2001,

(2) Market (demand)

1) Domestic market

Table 3.3.22 shows the recent trends in aluminum consumption by application. Clearly, power transmission lines and construction materials are major consumers of aluminum products in the country. It should also be noted that domestic demand declined abruptly in 1999. In fact, the local market is in a slump and aluminum wheel manufacturers operate at 25% of peak production levels. Two companies shutted down mills due to the withdrawal of an automobile assembler. Also, two manufacturers, who were major customers, relocated their factories to Mexico and Brazil due to the small local market (low purchasing power) and high labor costs. A manufacturer predicts that the local market for its products in 2001 will decline to 40% of the 1998 level due to sluggish local consumption.

TABLE 3.3.22 DOMESTIC CONSUMPTION OF ALUMINUM PRODUCTS

(1000 tons)

Application	1997	1998	1999
Construction	35.4	34.7	37.7
Electricity	84.5	85.5	57.7
Packaging	11.8	11.2	3.3
Transportation	11.5	12.0	12.4
Refrigerator	0.8	0.7	0.2
Consumer	2.7	2.4	1.0
Others	33.7	33.0	9.2
Total	180.4	179.5	121.5

Source：AVIAL Transforma Dec 2000 p.23

Table 3.3.23 shows the estimates of domestic alminum product supply and demand in the country. It should be noted that the figures are based on very rough estimate and should be adjusted if necessary data become available. For “domestic supply” data, accurate production data should be obtained. If not, secondary aluminum consumption as well as scrap consumption should be added to obtain a complete supply and demand table. In other words, domestic demand shown here does not include secondary aluminum and scrap consumption data.

TABLE 3.3.23 ESTIMATED DOMESTIC DEMAND FOR ALUMINUM PRODUCTS IN VENEZUELA

(1000 tons)

Item	Formula (source)	1997	1998	1999
(1)Domestic supply of primary aluminum1	Table 3.3.17	180.4	179.5	121.5
(2)Imports of primary aluminum	OCEI (Oficina Central de Estastica y Informacion)	2.9	0.7	0.5
(3)Imports of aluminum products	OCEI (Oficina Central de Estastica y Informacion)	24.6	41.7	44.3
(4) Exports of primary aluminum	Table 3.3.24	191.5	190.0	129.1
(5)Exports of aluminum products	(1)+ (2) + (3) - (4)	16.4	31.9	37.2

Source：JICA Study Team

As secondary aluminum and scrap are consumed in significant quantities for production of aluminum products, their consumption is estimated from other data. Table 3.3.25 shows exports of aluminum transformed products in 2000. In addition, the aluminum transforming industry reportedly uses 59% of its production capacity for export production and 41% for domestic production. Assuming that this ratio can be

applied to production measured by weight, and that the ratio for the year 2000 can be applied to the period between 1997 and 1999, domestic consumption of aluminum products can be estimated from the export data in Table 3.3.23 (4) by multiplying the 41/59 ratio, namely 133,100 tons in 1997, 132,000 tons in 1998, and 89,700 tons 1999. More precisely, these domestic consumption data are considered as the upper limit for estimate, compared to those estimated in Table 3.3.23 (5) as the lower limit. Then, the difference between the two estimates is considered as consumption of secondary aluminum and scrap, i.e., 116,700 tons in 1997, 101,100 tons in 1998, and 52,500 tons in 1999.

Table 3.3.24 shows aluminum product import trends. Major import items are plates, strips, sheets and household goods. Aluminum plates account for major portions of imports. The import tariff on aluminum products is 15%.

TABLE 3.3.24 ALUMINUM PRODUCT IMPORT TRENDS (1997～2000)

(1000 tons)

Product	1997	1998	1999	2000
Aluminum scrap	1.2	0.1	0.1	0.1
Aluminum powder/flake	0.1	0.1	0.1	0.1
Aluminum bars/shape materials	0.2	0.3	0.2	0.2
Aluminum wires	0.4	0.2	0.2	0.3
Aluminum plates	14.8	29.3	24.0	22.0
Aluminum foils	3.4	5.1	8.2	4.7
Aluminum pipes	0.4	0.3	0.3	0.4
Piping componets	0.2	0.0	0.1	0.1
Construction materials	0.5	0.8	1.6	1.1
Tanks/containers	0.0	0.0	0.0	0.0
Other tanks and containers	0.3	0.4	0.1	0.2
Liquidated gas containers	0.0	0.1	0.0	0.0
Stranded wires and cables	0.3	0.9	0.1	0.8
Household goods	1.4	1.9	5.5	2.6
Others	1.4	2.2	3.8	1.6
Total	24.6	41.7	44.3	34.2

Source：OCEI

2) Export market

Table 3.3.25 shows aluminum export trends by product category. Major export items are aluminum wires, stranded wires and cables, aluminum wheels, and scraps, which account for a combined total of more than 70% (1999). However, these items have gradually on the decline, and in particular, exports of stranded wires and cables dropped sharply in 1999, being one half that in 1998.

TABLE 3.3.25 ALUMINUM EXPORT TRENDS (1997～1999)

(1000 tons)

Product	1997	1998	1999
Aluminum products in total	191.5	190.0	129.1
Aluminum scrap	14.4	16.2	20.5
Aluminum powder/flake	8.3	0.0	0.6
Aluminum bars/shape materials	22.4	16.1	10.8
Aluminum wires	41.2	48.6	38.4
Aluminum plates	22.0	14.1	6.1
Aluminum circles	3.1	3.1	2.0
Aluminum foils	26.1	26.2	9.3
Aluminum pipes	0.4	0.4	0.3
Piping materials	0.0	0.0	0.0
Construction materials	0.2	9.5	0.3
Tanks/containers	0.0	0.1	0.1
Other tanks and containers	2.9	4.1	4.2
Stranded wires and cables	34.7	37.8	19.4
Household goods	0.7	0.8	0.2
Aluminum wheels	12.3	11.4	15.8
Others	2.9	1.6	1.1

Source : AVIAL Transforma Dec 2000, p.23

Table 3.3.26 shows major export destinations of aluminum products in 1999 and their respective share. The large importer is the U.S., which is the world largest consumer of aluminum products, followed by the Nertherlands and Spain. The later two countries and Peru mainly import aluminum wires and construction materials.

TABLE 3.3.26 MAJOR EXPORT DESTINATIONS OF ALUMINUM PRODUCTS FROM VENEZUELA IN 1999

Country	Share(%)
U.S.	22
Netherlands	17
Spain	15
Peru	10
Mexico	9
Colombia	7
Honduras	4
Pueroto Rico	2
Others	14

Source : AVIAL Transforma Dec 2000, p.24

As shown in Table 3.3.27, AVIAL has revealed its aluminum product export plan for 2001 - 2003 and has proposed solutions for problems that are identified as obstacles to the implementation of the plan, as shown in Table 3.3.28.

TABLE3.3.27 EXPORT PLANS BY THE ALUMINUM INDUSTRY IN 2001～2003

(tons)

Product	2001	2002	2003
Primary aluminum	443809	443809	424513
Aluminum scrap	30205	33037	37756
Aluminum bars/shape materials	9280	12923	14849
Aluminum wires	40959	57342	65534
Aluminum wheels	1421	1989	2273
Aluminum plates	3176	4447	5083
Aluminum foils	10342	14479	16548
Aluminum pipes	231	323	369
Construction materials	182	254	291
Other tanks and containers	5063	7089	8102
Stranded wires and cables	33048	46268	52878
Household goods	133	186	213
Others	1335	1869	2136
Aluminum products in total	164824	180276	206029
Grand total	608633	624085	660063

Source：AVIAL's presentation"POTENCIAL EXPORTADOR SECTOR TRANSFORMADOR DE ALUMINIO 2001-2003"

TABLE3.3.28 ISSUES RELATED TO AVIAL'S EXPORT PROMOTION AND RECOMMENDATIONS FOR IMPROVEMENT

Factor	Issue	Recommendation
Raw material	・Inadequate supply of castings and rolled products to meet the needs of transformers ・CAVSA's pricing and payment conditions work against export competitiveness	・Annual contract ・Pricing and payment conditions to ensure export competitiveness
SENIAT	・Failure and delay in reimbursement of IVA and drawback by several district offices	・Arbitration or guidance by competent agency to encourage the prompt reimbursement process
Loan	・High financial cost ・Credit guarantee ・Payment schedule	・Designing the loan mechanism to help improve export competitin ・Pre- and post-shipment loans to support exports
Management policy of state-managed enterprises	・Frequency change in top management ・No development or promotion policy or program for understream industries	・To ensure consistent administrative service to maintain continuity of administration policy as well as long-term sales and development policies

Source：AVIAL"POTENCIAL EXPORTADOR SECTOR TRANSFORMADOR DE ALUMINIO 2001-2003"

However, these recommendations lack strategic dimensions related to exports, including the definite goal setting, and are essentially requests to the government and the primary aluminum industry.

As shown in Table 3.3.29, 5 out of 9 companies visited by the study team were associated with export or related business. According to the data obtained by the study team, there are 30 SMEs in the aluminum transforming industry, which are related to export. Many of them point out poor service of government organizations in export-related procedures, including the delay in reimbursement of drawback and VAT.

TABLE 3.3.29 MARKET PREFERENCE OF SELECTED COMPANIES

Product category	Market	Export destination	Customer	Competitor (country)
Die castA	Local		Electrical	Taiwan
Pans and pots	Export50/local 50	U.S.	Household goods	PRC and Taiwan
Extrusion	Local 85/export 15	Colombia	Constructio n materials	
Almite	Local		Constructio n materials	
Die cast B	Local major/export minor	Germany	Electrical	PRC and Taiwan
Tube	Export70/local 30		Cosmetics/c hemical	Mexico, Brazil, U.S., Colombia
Aluminum wheel	Local		Automobile	PRC, Taiwan, Malaysia, Philippines
Stone washer	Local major/export minor	Dominica	Apprel	
Teflon flying pans	Local		Household goods	Colombia, France

Source：JICAStudy Team

To expand exports further, a strategic approach is required from the standpoint of encouraging aluminum transformers to upgade themselves to have the ability to make products of international quality at competitive costs and thereby to make inroads into the export markets by themselves.

(3) Current rating of enterprises surveyed

Table 3.3.30 shows the results of evaluation of the nine enterprises visited during the second field survey. Evaluation was made in terms of rating on a relative scale ranging from 1 (poor), to 2 (unsatisfactory), 3 (fair), 4(good), and 5 (excellent). Note that item “sales” should be rated on the basis of sales capability, but this evaluation focuses on capacity utilization. “Quality level” is evaluated in terms of rejection rate.

TABLE 3.3.30 EVALUATION OF NINE COMPANIES VISITED ON THE BASIS OF RELATIVE RATING

Category	Item	A	B	C	D	E	F	G	H	I
Quality	Equipment	1	2	4	1	1	5	4	2	5
	Quality level	3	3	3	1	3	5	2	3	3
Productivity	Production management	3	3	3	3	3	5	4	3	4
	Equipment maintenance	3	2	4	2	3	5	4	3	4
	Production technology	3	3	3	2	3	5	3	4	5
Marketability	Design	3	3	3	3	3	5	5	3	4
	Functionality	3	3	3	1	3	5	5	5	5
	Merchandisability	3	4	3	3	3	5	5	5	5
Price	Internal factors	2	3	3	2	3	5	2	5	3
	External factors	2	2	3	3	3	3	2	5	2
Sales	Sales	2	2	3	5	2	5	1	3	2

Source : JICA Study Team

Table 3.3.31 summarizes major problems identified by companies that were visited by the study team and responsed to the questinnaire sirvey.

TABLE 3.3.31 MAJOR PROBLEMS IDENTIFIED BY SELECTED ALUMINUM TRANSFORMERS (BASED ON RESPONSES TO THE QUESTIONNAIRE SURVEY)

Category	Item	Company A	Company B	Company C	Company D	Company E	Company F	Company G	Company I
Sales, marketing	Lack of competitiveness	○						○	
	Lack of competitiveness in product quality							○	
	Products lack marketability								
	Lack of sales skills		○	○				○	○
	Poor sales organization		○	○				○	
	Excessive competition with local companies	○	○		○			○	
	Others	a)	b)		e)				g)
Production technology	Aging equipment	○			○	○		○	
	Low levels of production technology				○	○			
	Issues related to production management system			○	○	○			
	Low productivity	○				○		○	○
	Others								h)
Business management	Employment and labor management	○			○	○			
	Procurement management	○		○	○	○			○
	Financial management			○	○	○			
	Inventory control			○		○			○
	Training system	○			○			○	
	Others								
Raw materials and utilities	Instable quality of raw materials			○	○		○	○	○
	Unreliable delivery of raw materials								○
	Instable material prices			○		○	○	○	○
	Unreliable supply of utilities					○	○		○
	Others								
Political, institutional, environment	Taxation/tariff system				○	○	○	○	○
	Government procedures and public service				○	○	○	○	○
	Strict regulation					○	○	○	
	Pollution control and environmental preservation costs				○	○	○	○	
	Lack of government support			○	○	○	○	○	○
	Shortage of training institutes		○	○			○	○	○
	Poor levels of public training		○				○	○	
	Others		c)	d)			f)		i)

a)Lack of environmental conditions conducive to globalization

b)Lack of die cast manufacturers (only aluminum plate processors)

c)Shortage of training facilities, lack of market and export support

d)Financial access

e)Poor cash flow due to delay in payment for government procurement

f)Problems related to customs and customs clearance procedures

g)Need for low-cost loans and capital

h)Sluggish domestic market

i)Lack of effective incentive for export promotion

j) Difficulty in procurement of raw materials and severe contraction of the domestic market

Source: JICA Study Team

1) Production facilities and equipment

Table 3.3.32 shows production capacity of the aluminum transforming industry and its utilization rate in 2000, as estimated by AVIAL, and share of export production and production for the domestic market. The total production capacity is estimated at 414,240 tons/year, the capacity utilization rate 54%, ratio of export production to local production 59:41.

TABLE 3.3.32 PRODUCTION CAPACITY OF THE ALUMINUM TRANSFORMING INDUSTRY AND CAPACITY UTILIZATION RATE

Category	Capacity 1000 tons/year	Utilization rate %	Share of export production	Share of local production
Electrical wires and cables	190.0	50	72%	28%
Construction materials (bars/shape materials)	47.1	49	30	70
Packaging materials (slug and tube)	54.5	54	65	35
Transportation equipment (components)	22.7	68	80	20
Rolled products (sheets, plates, foils)	100.0	50	50	50
Total	414.2	54	59	41

Source: AVIAL"POTENCIAL EXPORTADOR SECTOR TRANSFORMADOR DE ALUMINIO 2001-2003"

Major hightlights of corporating rating in Table 3.3.30 are described as follows. Company F has fully automated production lines and appears to be capable of manufacturing products of world class marketability. Company C has the extructing equipment made in the U.S. and is willing to upgrade it to larger machines. Company I makes products under manufacturing and sales licensing from world-class companies and appears to have well-designed production lines. Company G has low pressure casting machines made in the U.K. and a number of machine tools, but many of them are relatively old and outdated. Other companies have also outdated machines that are relatively well maintained. The results of the questionnaire survey in Table 3.3.31 indicate that 5 out of 11 companies cited deterioration of production equipment as a major problem.

Some companies make capital investment on a continuous basis. An extrusion shop has introduced an extruder for continuous casting of long billets (5m) in an attempt to improve productivity. An anodized aluminum manufacturer is upgrading outdated equipment to meet demand that is expected to increase as the number of manufacturers has declined from 10 to 2. Nevertheless, most enterprises are facing the decreased

order. Many managers believe that the present production equipment suffices to meet domestic demand in consideration of the low capacity utilization rate under the current recession.

2) Production technology and management

As seen in Table 3.3.30, corporate evaluation indicates that Companies F, C and I keep higher levels of production technology. For instance, die cast manufacturers primarily serve electrical manufacturers with relatively low quality requirements and do not require high levels of production technology, which are needed to meet demand for automotive parts (growing worldwide). On the other hand, aluminum wheel manufacturers experience high in-process rejection rates because their products are shipped to automobile manufacturers. Finally, stone washer manufacturers can offer their own technical advantages, unlike volume OEM products, and represent one example of strategic direction for small manufacturers. The results of the questionnaire survey in Table 3.3.31 indicate that 2 out 11 companies realize that their levels production technology are low. 5 out of 11 companies cited the production management system as a major problem.

3) Introduction of technology

A flying pan manufacturer visited by the study team exclusively hold licenses from foreign companies. A tube manufacturer has introduced an impact deep drawing sytem technology from the U.S, with equipment.

4) Procurement and sales

As shown in Table 3.3.31, 6 out of 11 companies pointed out instable quality of raw materials and 7 companies instable material prices. Aluminum transformers currently purchase ingot at LME prices, and they want domestic the prices to be lowered to the levels that allow competition with foreign manufacturers. They want to enjoy benefits from operating in the country where aluminum is produced from aboundant resources using cheap electricity. As for CAVSA that is the sole distributor of aluminum ingot, it does not have its own physical distribution system, forcing manufacturers o pick up ingots at CAVSA's warehouse in Bolivar. Also, sales lots are excessively large for small manufacturers to create financial burdens.

As for sales and distribution, 4 out of 11 companies cited the lack of sales skills, 3 a poor sales organization, and 5 excess comptition.

5) Education and training

In the quetionnaire survey, 6 out of 11 companies complained about the shortage of training organizations, and 4 the poor level of training. Some pointed out poor vocational training at INCE. In addition to INCE, there are private vocational training schools. For instance, CEDEA (Centro Eurovenezolano Desrrollo Empresarial de Aragua) in Aragua was established jointly under the agreement among the Aragua state government, the European Union, and private enterprises. The state government provides facilities, infrastructure and their maintenance, the EU is responsible for technical support, machinery and equipment, and a group of private enterprises provides partial funds and information. CEDEA is managed jointly by the state government, private enterprises, INCE, the Ministry of Education, and chambers of commerce and industry in other states. Secondly, the Metal Mechanic Center located in the technopark of the national Simon Bolivar university plans to offer a course on die engineers. The first course is scheduled to start in October 2001. It will teach design, manufacture and finishing of dies to 12 engineers (university graduates) for 9 months. The course is unique in providing practical training by actually making dies for companies on a contract basis.

Human resources required by the aluminum transforming sector are diverse, but the most important skill is die design and manufacture, which should be taught in a well-designed course.

6) Trade association and other collaborative activities

AVAL has an office in Caracas, which has two permanent staffs, but has no branch office. Its membership totals 31 firms. It issues a house organ "AVIAL Transforma" annually. While current activities are sufficient for the small organization, the trade association representing the aluminum industry in the country, which is the fifth largest aluminum producer in the world, should have a secretariat of larger size and wider functions. It is expected to address not only the issues related to export promotion, but the challenge to reinforce the domestic industry as well. First of all, it should collect and publish statistical data on production of aluminum products on a continuous basis. Also, AVIA should hire experts who plan, monitor and manage the ways to achieve various objectives and goals in ongoing programs, to measure the results, and feed back information for subsequent activities. Then it needs good planners who can conceive ideas to vitalize VIAL's sponsored activities all the time. Such systematic approach is required to develop an efficient production chain for the aluminum industry.

Table 3.3.34 presents data on the aluminum production chain "CADENA." It spearheads joint activities by the government and the private sector to foster downstream industries for the aluminum sector. Various activities are conducted on the basis of an action plan that is made every three months.

TABLE 3.3.33 AVIAL (ASOCIACION VENEZOLANA DE LA INDUSTRIA DEL ALUMINIO)

General profiles	Non-profit organization: To serve as the voice for the aluminum industry to discuss union, labor and environment-related issues. Contribution: To promote activities by member companies, foster collaboration among them, and pursue organizational unity. Effect: To reinforce the sector and products that have high potential to bring major revenues for the country, next to crude oil.
Officers	A president, a vide president, and 9 directors
Membership	Aluminum transformers, users of aluminum parts, and suppliers to the aluminum industry
Objectives	1. To represent the common interest of companies associated with aluminum. 2. To monitor free competition in the aluminum industry and participate in the administrative and judicial process to prevent unfair foreign trade. 3. To provide service for members in a variety of fields, including legal, technical, quality control, strategic planning, illegal trade, production management, information system, and market strategy.
Mission	1. To become a national sector integrating aluminum manufacturers and transformers and create their unique image in the world. 2. To ensure logical development of the domestic aluminum industry by taking into account appropriate guidelines for production of high value added products accompanied by foreign demand and market expansion potential, production efficiency, market efficiency, and the country's competitiveness.
Goals	1. To promote use of aluminum products in the country and their exports. 2. To promote standardization in the country and development to international levels. 3. To enforce policy to the sector and disseminate policy from the sector, and coordinate strategic collaboration. 4. To promote the sector through forums and events. 5. To support aluminum-related research activities. 6. To promote R&D in the aluminum sector 7. To deploy occupational safety and health, and environmental protection programs.

Source : AVIAL Transforma Dec. 2000

TABLE 3.3.34 ACTIVITY OF ALUMINUM PRODUCTION CHAIN "CADENA

Members	AVIAL、CAVSA、MPC、MPD
Established	April 1999, by representatives of primary aluminum manufacturers, aluminum transformers, and the central government.
Activiites	1. Information gathering and preparation of the participants' list 2. Workshops - Factors affecting aluminum transformers - Case studies on BANCOEX, SENIAT and CORPBANCA that cooperate with the aluminum production chain for export promotion purposes - Export plans for the aluminum industry in 2000 – 2004 - CAVSA's sales policy 3. Discussion with SENIAT on drawback of VAT 4. Promotion of research on projects to reinforce competitiveness of the aluminum transforming industry 5. Support for the corporate development center in Aragua 6. Discussion on issues related to supply of aluminum ingot to the aluminum transforming industry and sales

Source: CADENA DEL ALUMINIO Y SUS SECTORES TRANSFORMADORES, RESUMEN DE LAS ACTIVIDADES REALIZADAS EN EL PERIDO 2000-2001

3.3.4 Recommendations for improvement

The aluminum transforming industry faces the urgent problem to deal with, the decline in capacity utilization rate and the decrease in sales due to the sluggish demand. At the same time, it must promptly take effective measures to expand the market in the long run. In this section, recommendations are made to address these needs.

(1) Strategic guideline

1) Rationalization of the primary aluminum industry

CVG, as a public corporation representing the primary aluminum industry, is expected to develop and execute programs focusing on SME promotion. In particular, it should make efforts to expand the market from the viewpoint of customer service and satisfaction. In particular, it has two major tasks to carry out. First of all, it should listen to the requests of aluminum transformers, including the lowering of ingot prices, and take appropriate action for the interest of promoting SMEs. Secondly, it should enhance its ability to play a leading role in technological development as well as product development in the downstream sector by providing testing, research, technical consultation and financial service functions.

2) Upgrading of the aluminum transforming industry

Demand for high value added products serves as an impetus for upgrading of any industries including aluminum transformation, because it requires advanced equipment skills. To spur such demand, MPC should take leadership in initiating project to expand the markets for aluminum products in the long run, particularly the domestic market.

(2) Deployment of strategic guideline

1) Rationalization of the primary aluminum industry

The primary aluminum industry and the aluminum transforming sector has discussed the issues related to supply and sales of raw materials. However, negotiation seems to be suspended due to the change in management on both sides. They have reportedly discussed the establishment of supply stations (stock points) to deliver ingots from the manufacturer to aluminum transformers, provision of free transportation service, optimization of lot size, and the establishment of discount prices. It is important to realize that these issues are boiled down to the zero sum game – one side profits at the other's loss (A benefit of one party creates a burden on

the other.) Thus, so long as the two parties negotiate from their own ground, the conflict is difficult to solve. It is therefore recommended that CVG make the first move to resolve the supply problem for aluminum transformers. It should propose and implement a plan to develop an optimum supply system from the interest of promoting its sales. As for discount prices, CVG should accept and review the request from each transformer. If a discount price is approved, it should be treated as sales promotion expenses. This way, an efficiency supply system can be quickly installed, at least in its preliminary form. At the same time, CVG will be able to obtain information on competitiveness of the downstream sector and use it for development of its marketing strategy.

It is important to take advantage of the industrial structure vertically integrated under the public corporation. Public policy targeting the primary aluminum industry can be effectively and promptly implemented. It is therefore recommended to work with CVG in setting policy targets and goals, measuring the results, and promoting activities.

2) Upgrading of the aluminum transforming industry

Aluminum transformers visited by the study team are roughly classified into the following four categories.

a. Tube manufacturers: They have international competitiveness, which can be further reinforced if ingots are supplied at discount prices.

b. Extrusion manufacturers: They make capital investment on a continuous basis and are willing to keep it in the future. They have sufficient production capacity to promote strong growth if effective demand exists. And they will be able to improve competitiveness further if discount price and other favorable conditions are given. Rolled product manufacturers are also in the same situation.

c. Aluminum wheel manufacturers: They were previously expected to become internationally competitive. However, their market contracts rapidly due to sluggish demand. Also, they have some quality problems.

d. Casting manufacturers other than car wheels: They generally require modernization in terms of production equipment and techniques. They can supply products that meet requirements of present customers, namely manufacturers of electrical

equipment and consumer products, whereas they are capable of making automotive parts, which provide them with a great opportunity for market expansion. At present, automotive parts using aluminum castings, including engines, power trains and suspensions, are imported in the form of assembly from foreign sources. Although localization is not being demanded for the time being, development of the aluminum casting industry needs to be promoted from the viewpoint of SME promotion.

In consideration of the above factors, the following actions are proposed as core elements of the medium-term market development project to be implemented under the leadership of MPC.

a. Development of new alcohol beverages to spur demand for aluminum cans
b. Establishment of design standards to promote use of aluminum members for low-income public housing
c. Establishment of a product development workshop for automotive castings

These proposals set forth the primary objectives: (1) to develop an alcohol drink for lunch; (2) to use the public works project for SME promotion; and (3) to encourage CVG with technology and funds to develop the ability to manufacture automotive castings, thereby to create incentive for local procurement of automotive parts and transfer technology to SMEs. Each proposal is described in detail, as follows.

a. Development of new alcohol beverages to spur demand for aluminum cans

In Japan, 1,340,000 tons of aluminum plates were manufactured in 1999 and 410,000 tons (30.5%) were used for production of beverage cans. In Venezuela, beverage demand is expected to grow steadily, together with aluminum demand for soft drink and beer cans. In addition to such demand, it is proposed to develop a new beverage suitable for an aluminum can. For instance, it is recommended to study development feasibility of an alcoholic drink for lunch, which is based on the famous rum and contains 2-5% alcohol. It will be offered in 250ml and 350ml aluminum cans, but not glass or PET bottles. Cans should be designed elaborately, including the shape and package, and may vary according to the consumer group (elderly, women, youth) and occasion (party or business lunch).

b. Establishment of design standards to promote use of aluminum members for low-income public housing

In 2001, the country underwent the outbreak of the dengue fever, which caused extensive and serious damage. The disease was carried by mosquito, which bred

massively in and around low income communities that accounted for the bulk of the country's population. Unsanitary conditions in these communities should be improved urgently. An effective solution is to build public housing to accommodate low income people who are living in the desolate environment. And aluminum materials are suitable for public housing. In Japan, 1,070,000 tons of extruded aluminum materials were made in 1999, of which 51.6% (550,000 tons) were used for window frames and 16.5% (176,000 tons) for other construction materials. In Venezuela, 38,000 tons of aluminum products were used for construction purposes in 1999, accounting for 31% of aluminum consumption in the country. The market was second largest next to wires and cables (58,000 tons, 48%). In fact, extrusion manufacturers and anodizing processors visited by the study team were busy in meeting orders. To stimulate demand, the proposal includes the establishment of design standards (specifications) to promote use of aluminum materials for low-income public housing. As aluminum materials can be used for various parts of an house, including windows sashes, handrails, partitions, light weight beams, and doors, design standards to specify their use create large demand that enable cost reduction through economies of scale. Aluminum materials can be corrosion resistance by anodizing treatment and can be dyed in various colors. Use of aluminum materials may raise the initial cost of housing construction, but it improves durability, asset value and an image of public housing. Also, the manufacture and installation of aluminum members is suitable for SMEs and thus serves the objective of SME promotion. Finally, the project can be readily implemented under the government's leadership. Once manufacturers specialized in aluminum housing materials emerge, exports to neighboring countries will become feasible.

c. Establishment of a product development workshop for automotive casting

Generally, the automobile industry is a major consumer of aluminum castings and forgings. In Japan, 90.8% of aluminum castings produced in 1999 (341,000 tons) and 73.1% of aluminum die cast products (557,000 tons) were used for automobile production. Approximately 10 million automobiles were produced in that year. On the other hand, in Venezuela, 94,000 vehicles were assembled in 2000. As pointed out earlier, automotive components that use castings and forgings (engines, power trains, suspensions) are imported as unit assembles and are not produced locally. There is no plan or prospect for localization. To promote localization of aluminum castings and forgings for automobiles, ALCASA or VENALUM should launch a project to develop production capabilities. Once production techniques and other

know-how are established, they can be transferred to SMEs. This way, the supplier base for aluminum parts is established. As the first stage of the project, the production process should be selected according to potential demand and quality requirements, such as sand casting, mold casting, die casting, and squeeze casting. The project should require participation of automobile assembly manufacturers in Venezuela and Andes countries. This project is highly recommended because it has great growth potential in breadth and depth. Indispensable in production of castings and forgings is the ability to make models and dies. Today, wood patterns for sand casting, and dies used for die casting, low pressure casting, die casting, squeeze casting, press work and forging are shaped automatically by machine tools. However, their design, assembly and finishing still require personal skills in some parts, although increasing portions are standardized. As most production techniques for casting and forging are implemented in the die, the manufacturer without die making capability must give away its technical know-how to an outside contractor that makes the die. Thus, die making technology is the first thing to be attained by casting and forging manufacturers. Also, it creates opportunity for SMEs to win contracts from large manufacturers because of small lot production. Once castings are localized, forgings will become the next target.

Machinery and equipment for casting and forging operations is available from Europe, the U.S., Japan and Brazil, including those having special specifications. Thus, their local production is not necessary for the time being. As production techniques improve and more complex parts are made, demand for sophisticated equipment grows to require local manufacturers.

Furthermore, production of “all-aluminum” cars might take place in Venezuela to provide incentive for automobile production in the region. At present, all-aluminum cars are not manufactured at all or in minimal quantities, but there is possibility of resumed production. Honda has once decided on commercial production of RSX earlier than others. Audi uses aluminum space frames for A8 car (Note 1), which are manufactured by ALCOA. For volume production, ALCOA has built a workshop adjacent to Audi’s A8 assembly plant. At present, use of aluminum materials in place of steel entails a number of problems to be solved, including the low Young’s modulus, large variation in spring back characteristics when plates are shaped in press work, and the need for large current and power for welding. As a result, production costs are much higher. Nevertheless, the value of aluminum as a recyclable material

will receive attention in due course as it becomes increasingly important for the benefits of energy saving and environmental protection. In fact, this is an ideal model for evolution of the entire industry in Venezuela, where new demand drives new technology and industry.

d. Promotion of R&D related to aluminum products

To promote the downstream (aluminum processing) industries so as to increase value added by the domestic aluminum industry, while boosting supply of aluminum products to the domestic and export markets, it is recommended to initiate joint R&D projects on aluminum product development under the leadership of primary aluminum manufacturers and the participation of smaller aluminum processors. More precisely, primary aluminum manufacturers under CVG (including VENALM and ALCASA) will lead development efforts on aluminum processing technologies, including the development of new applications. Then, technologies so commercialized will be transferred to aluminum processing industries, together with technical assistance to establish production technology. At the same time, primary aluminum manufacturers will develop new aluminum products that substitute for other materials and select prospective products on the basis of market study inside and outside the country, followed by focused promotion of their commercialization. Market study will be conducted in cooperation of INAPYMI (domestic market) and BANCOEX (export market), together with universities, technoparks and other public research organizations as required.